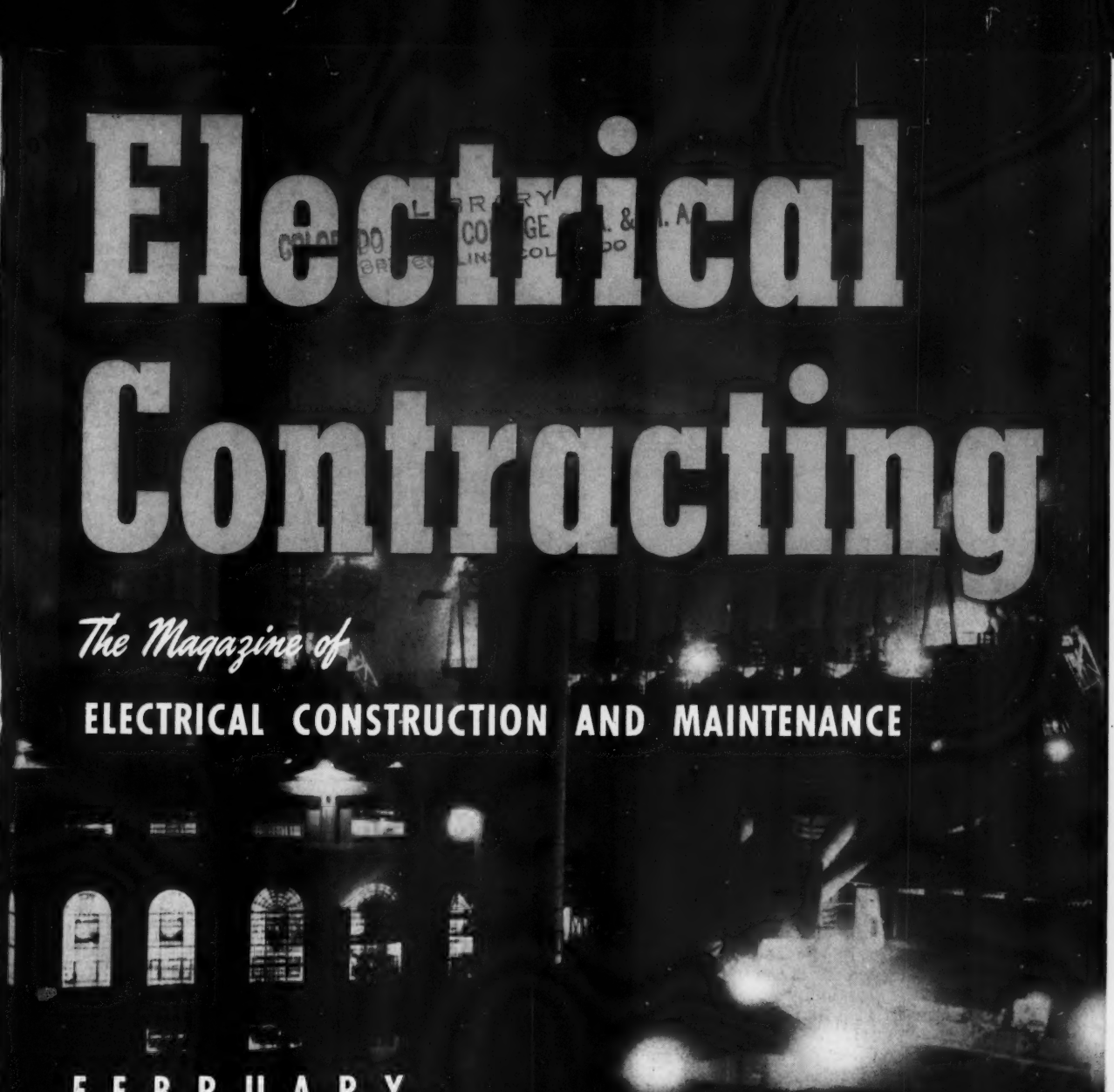
Electrical Contracting

The Magazine of

ELECTRICAL CONSTRUCTION AND MAINTENANCE



FEBRUARY

1943

Accent on wiring design, equipment selection and salvage of waste light can save critical materials without sacrificing essential industrial illumination intensities. See Pages 19 to 27.

INDUSTRIAL ELECTRIFICATION SECTION—Pages 57-68

UMI

Here's More Proof

that the RIGHT instrument makes trouble shooting a CINCH

Mr. Rusfeldt is using his AK-1 to locate the damaged coil after tracing the grounded-coil bank.

READ how the RIGHT instrument helped Mr. A. Rusfeldt, electrician at the Michigan Alkali Quarry, save valuable production time:

"A surge grounded a coil in our crusher motor. There were no visible smoke marks or splashes to show where to look for it. We started to use the old-fashioned test of opening connections and ringing with a magneto. Then I realized that this was just the job for our G-E AK-1 hook-on instrument.

"With a resistance connected in series with the winding, we ran current (110 volts, a-c) through the winding to ground. We then traced out the grounded bank of coils by clamping on over the jumpers. On the third try we found it."

Green Hands Make It Even More Necessary to Have the RIGHT Instruments

An experienced man like Mr. Rusfeldt could have found the trouble without the AK-1 (described below). But it saved him time—valuable crusher production time.

How much more important to have the RIGHT instruments for your inexperienced men! They don't know the short cuts and ingenious ways of testing electric equipment. It will pay you to be *sure* you have all the instruments needed for your maintenance work.

HERE'S HOW WE CAN HELP YOU

1. *If you need* a testing instrument, the five shown below will do 90 per cent of all testing jobs (prices are for estimating only). Bulletins listed give complete data.

2. *If these do not answer,* tell us what you need. The chances are we can send you a bulletin describing just the instrument for your purpose.

3. *If you'd like help* in selecting an instrument for a specific job, call the nearest G-E office. One of our instrument men will be glad to assist you.

General Electric Company, Schenectady, N. Y.

WHICH OF THESE TESTING INSTRUMENTS DO YOU LACK?

A-C HOOK-ON VOLT-AMMETER. The handiest of instruments for quick load checks—no cutting conductors or interrupting service. Measures volts also. Bulletin GEA-2950.

MEDIUM-SIZE PORTABLE, A-C (AND DP-9, D-C). Accurate within ¾ of one per cent. Very portable—size only 2½ by 6½ by 4¾ inches. Price covers a 5-amp ammeter. Bulletin GEA-1784.

POCKET-SIZE PORTABLE, A-C (AND DS-5, D-C). Accurate within one per cent. Slips easily into a coat pocket—size 2 by 3½ by 5½ inches. Price covers a 5-amp ammeter. Bulletin GEA-1784.

INKLESS RECORDER, PORTABLE. An inexpensive instrument. Inkless—no pen to start and no ink to spill. Price covers a 5/10-amp ammeter. Bulletin GEA-3187.

INK RECORDER, PORTABLE AND SWITCHBOARD. Ideal for use where a high degree of accuracy is very important. Price covers a 5-amp portable ammeter. Bulletin GEA-1061.

GENERAL ELECTRIC

602-41-6200

UMI

"WE BUY 'EM FOR SERVICING FLUORESCENTS—

—and now every mechanic grabs 'em!"

•

Such FLEXIBILITY in REACH, HEIGHT and MOBILITY makes this the SAFEST, FASTEST MAINTENANCE LADDER ever known

•

You tell us the height and side-ways reach you need and your minimum aisle width—then we'll come back with data on the *one* ladder that will do the safest, fastest, most satisfying service that money can buy. Relamping need not interfere with production. Metropolitan Device Corporation, Brooklyn, N. Y.

Send for the full story in pictures!

Murray crow's nest

METROPOLITAN DEVICE CORPORATION
Brooklyn, N. Y.

Send me data (without obligation) on the Murray Crow'snest best suitable for our requirements. Our ladder must reach____ feet high and extend____ feet side-ways. Aisle width is____ feet.

NAME and TITLE_____

COMPANY_____

ADDRESS_____

ELECTRICAL CONTRACTING, Published monthly, price 25 cents a copy. Vol. 42, No. 2. Allow at least ten days for change of address. All communications about subscriptions should be addressed to the Director of Circulation, Electrical Contracting, 330 West 42nd Street, New York, N. Y. Subscription Rates —U. S. A., and Latin-American Republics, $2.00 a year, $3.00 for two years, $4.00 for three years. Canada $2.50 a year, $4.00 for two years, $5.00 for three years. Great Britain and British Possessions 18 shillings for one year, 36 shillings for three years. All other countries $3.00 a year; $6.00 for three years. Entered as second-class matter August 29, 1936, at Post Office at Albany, N. Y., under the act of March 3, 1879. Printed in U. S. A.

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"SEE-ABILITY" adds manpower!

Who says they never come back? There are thousands of older, experienced workmen going back on the job for the duration. The knowledge and ability of these men is needed in our war factories—men who know how to handle machines and equipment, how to get things done.

Improved See-ability through good lighting has made it possible for these older men to put their skill to work. For sharp vision, men in their sixties require more light than men in their twenties.

In placing these men, therefore, it is necessary to check up on the See-ability needed for the work they are to do. In many cases this can be improved by making better use of present lighting equipment, checking reflective values of paint, distance of the lamp, avoiding shadows and glare. Helpful suggestions along these lines are included in a Westinghouse booklet, "See-ability for Indoor Eyes." If you would like a copy, simply write Department G-1, Westinghouse Electric and Mfg. Company, Bloomfield, New Jersey. Your local power company will also be glad to help you get more See-ability from your lighting equipment.

UMI

See-ability in our war factories is now improved through better fluorescent lamps. Westinghouse Mazda fluorescent lamps are brighter from end to end, longer lasting, lower in cost, than ever before.

Westinghouse

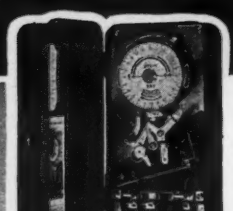
★ MAZDA LAMPS ★

FOR GREATER SEE-ABILITY

MULTIPLY

THE ADVANTAGES OF PROTECTIVE FLOODLIGHTING WITH . . .

AUTOMATIC CONTROL



DURING BLACK-OUTS

IF a master-switch is pulled during temporary black-outs, Form VSWZ will continue to run for 10 hours. During any current interruption, an automatic carry-over feature provides for clock-spring operation of the complete time-switch mechanism. When the current is restored, the clock-spring rewinds automatically and the time-switch resumes its normal operation.

SANGAMO TIME-SWITCHES

THE advantages of protective floodlighting systems for factory yards, building approaches, railroad sidings, storage yards, and other vital property serving in war production, are multiplied when full automatic control is used. A Sangamo Astronomic Dial Time-Switch with synchronous carry-over provides this kind of control. It changes its operating sequence daily, so that the "on" and "off" operations of the lights conform with sunset and sunrise. Its sequence of operations remains undisturbed by power interruptions up to ten hours. It requires no manual operation nor re-setting the year 'round. Select this, or any other form best suited for your specific needs from the complete line of Sangamo Time-Switches.

SANGAMO ELECTRIC COMPANY SPRINGFIELD ILLINOIS

UMI

Plastic Planes have proven The Strength of Resin-bonded Plywood

Synthetic resin-bonded plywood is helping win the war on many fronts. The Timm Aermold Model N2T-1, illustrated above, is in service as a trainer for the Navy. Plastic-bonded plywood is also used in gliders, PT boats, concrete forms, and other applications contributing to the war effort.

Now SPERO Offers Resin-bonded Plywood Fluorescent Fixtures . . .

Lower illustration shows the SPERO Dur-o-lite fluorescent fixture —with reflector and raceway of synthetic resin-bonded plywood. This model also available with steel raceway and plywood reflector.

"DUR-O-LITE"

REQUIRES LESS THAN 6 OZ. OF STEEL PER FT.

Here is SPERO's answer to the limitation order L78. This unit eliminates steel not only from the reflector, but from the raceway as well. Made of the same synthetic resin-bonded plywood used in plastic planes and gliders, it easily meets all requirements for strength and durability. Reflecting surface takes the same high-gloss white finish (reflection factor 88%) and the unit presents no difference in appearance from steel fixtures. Only metal outside of auxiliary equipment is in metal ends and tube supports. If desired, units can be supplied with steel raceway.

Designed for industrial installation, Spero DUR-O-LITE meets the Bureau of Standards specifications for fluorescent reflectors. Models are available for two or three 40 watt tubes. They may be equipped with standard ballast and starters, or with the new Spero development INSTA-LITE, which combines functions of ballast and starter, and provides instantaneous illumination without flicker or delay. By eliminating the starter switch, INSTA-LITE materially reduces maintenance cost, since starters are the most frequent cause of fluorescent light failures.

With NEW INSTA-LITE gives you Instant Starting and Instant Lighting with NO starting switch

Don't pass up profitable War Plant installations. Get the facts about the new DUR-O-LITE today. SPERO offers you the most modern line of industrial fluorescent and incandescent fixtures... Distributed only through electrical wholesalers.

FIVE LINES OF PRODUCTS **FROM ONE DEPENDABLE SOURCE**

THE SPERO ELECTRIC CORPORATION
18222 LANKEN AVE. ★ CLEVELAND, OHIO

THERE STILL IS *Porcelain*

NO LET DOWN IN WIRING QUALITY . . . PERMANENCY . . . DEPENDABILITY . . . ECONOMY . . . NOR IN EASE OF INSTALLATION . .

ILLINOIS

COMPLETELY INSULATED

ALL PORCELAIN WIRING SYSTEMS . . .

TOGGLE SWITCH PLATE

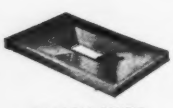
Trade Mark Reg. U.S. Pat. Off. Bull Dog

Look for this Trade Mark

STANDARD KNOBS

OUTLET BOXES AND COVERS

STANDARD TUBES



SWITCH BOXES AND COVERS

CLEATS

RECEPTACLE COVER DUPLEX

● Porcelain conforms to the National Electrical Code—Porcelain saves metal—Porcelain is available—Illinois completely insulated all porcelain wiring systems are old in terms of years of service. They have made it possible for contractors to continue right along with wiring installations—no time-outs for materials.

No vital materials go into the production of porcelain—yet, materials do go into porcelain that make these systems durable—that are not affected by rust or corrosion—that make possible full safety—that make these systems valuable where there is dampness and fire hazard.

You can do an up-to-the-minute wiring job with an Illinois Porcelain System—you can guarantee these systems for longest service life.

Porcelain is a logical material too because it conserves vital metals for our victory effort.

Illinois all porcelain wiring systems are adaptable to practically all wiring plans and layouts. They can be installed without grounding.

For that next installation job, sell an Illinois all porcelain wiring system.

Illinois **ELECTRIC PORCELAIN CO.** MACOMB, ILLINOIS

UMI

We're Rolling Our Own!

EFFICIENT LIGHTING DEPENDS ON CONTROLLED QUALITY—EVERY STEP OF GUTH CONSTRUCTION IS UNDER GUTH SUPERVISION

Uncle Sam clamped the lid on when he said, "No more metal for Fluorescent Reflectors!"

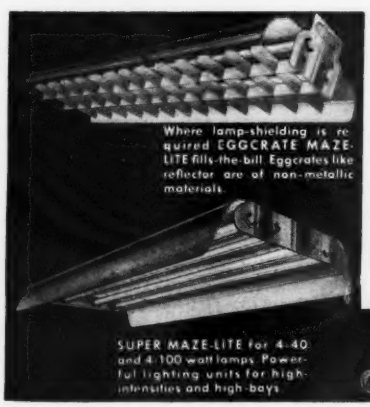
We decided to use Genuine MASONITE "Reflector-Board", the best fibre-board made for reflector purposes.

But equipment for cutting, smoothing, bending and forming the board was absolutely unavailable.

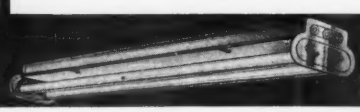
Then we discovered some machine tools that formerly were used in rolling bronze panels.

With a little ingenuity, we built our own machines from these almost worthless scraps—and we made them work!

TODAY, we are in production making our own high quality non-metallic Fluorescent Reflectors. Every one of them is a tribute to the adaptability of American industry to meet emergency conditions!


Where lamp-shielding is required EGGCRATE MAZE-LITE fills-the-bill. Eggcrates like reflector are of non-metallic materials.
SUPER MAZE-LITE for 4-40 and 4-100 watt lamps. Powerful lighting units for high-intensities and high-bays.

The GUTH LINE manufactured by the Edwin F. Guth Company, St. Louis, Mo., features the use of genuine MASONITE "REFLECTOR-BOARD" reflectors in compliance with W.P.B.'s order L-78 dated October 19, 1942. The cartoons above describe a minor, but important American drama—important in that the Guth Line can be offered as a varied line—with different shaped reflectors, to perform the many tough Industrial lighting jobs that help increase War Production.



FLUOFLECTOR units for 1 and 2 rows of lamps. For inspection lighting and over benches.

★ ★ ★ ★ ★ ★ ★ ★

Leaders in Lighting Since 1902 **Guth**

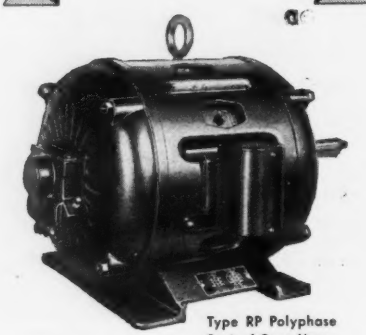
★ ★ ★ ★ ★ ★ ★ ★

THE EDWIN F. GUTH CO. • 2615 Washington Ave. • St. Louis, Mo.

THREE WAGNER PRODUCTS that will speed your War Production

You can be assured of reliable performance, low maintenance and continuity of service in your "all-out" production efforts by specifying Wagner for all your motor, transformer and bridge-brake needs. You can depend upon Wagner too, because Wagner's large, modern plant is operating day and night to meet the demands for these items – products that have proved their efficiency and dependability through 50 years of faithful service to industry.

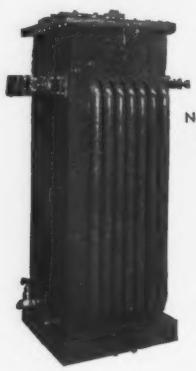
MOTORS



Type RP Polyphase Squirrel-Cage Motor.

Wagner motors are built in a wide range of types and sizes with electrical and mechanical characteristics to fit the requirements of all types of motor-driven machinery and equipment. Bulletins MU-176, MU-182 and MU-183 illustrate and describe the complete line of Wagner motors. Everyone responsible for the purchase and maintenance of motors should have these bulletins.

TRANSFORMERS



Noflamol Transformer, (Non-Inflammable Liquid Filled.)

No matter what the requirements may be, Wagner can furnish the right transformer for the job. The Wagner line of transformers include power, distribution, and Noflamol transformers, and constant-current regulators. Bulletins TU-180 and TU-181 give complete information on the complete line. These bulletins contain information valuable to every transformer user.

BRIDGE BRAKES

Type H Hydraulic Bridge Brake.

Today, Wagner bridge brakes are standard equipment on most overhead cranes. Wagner bridge brakes are available in type H for inside cranes, and type HM for outside cranes where automatic parking attachment is desirable. You should have bulletin IU-20. It will be mailed you on request.

Field Engineering Service!

★

Wagner has 25 sales and service branches located throughout the country. Trained field engineers are always ready to assist you in selecting motors, transformers, or hydraulic bridge brakes, to meet your particular requirements.

Wagner Electric Corporation
6400 Plymouth Avenue, Saint Louis, Mo. U.S.A.

EC 843-1

Gentlemen:

I would like to have free copies of motor bulletins MU-176, MU-182, and MU-183 ☐. Transformer bulletins TU-180 and TU-181 ☐. Hydraulic bridge brake bulletin IU-20 ☐.

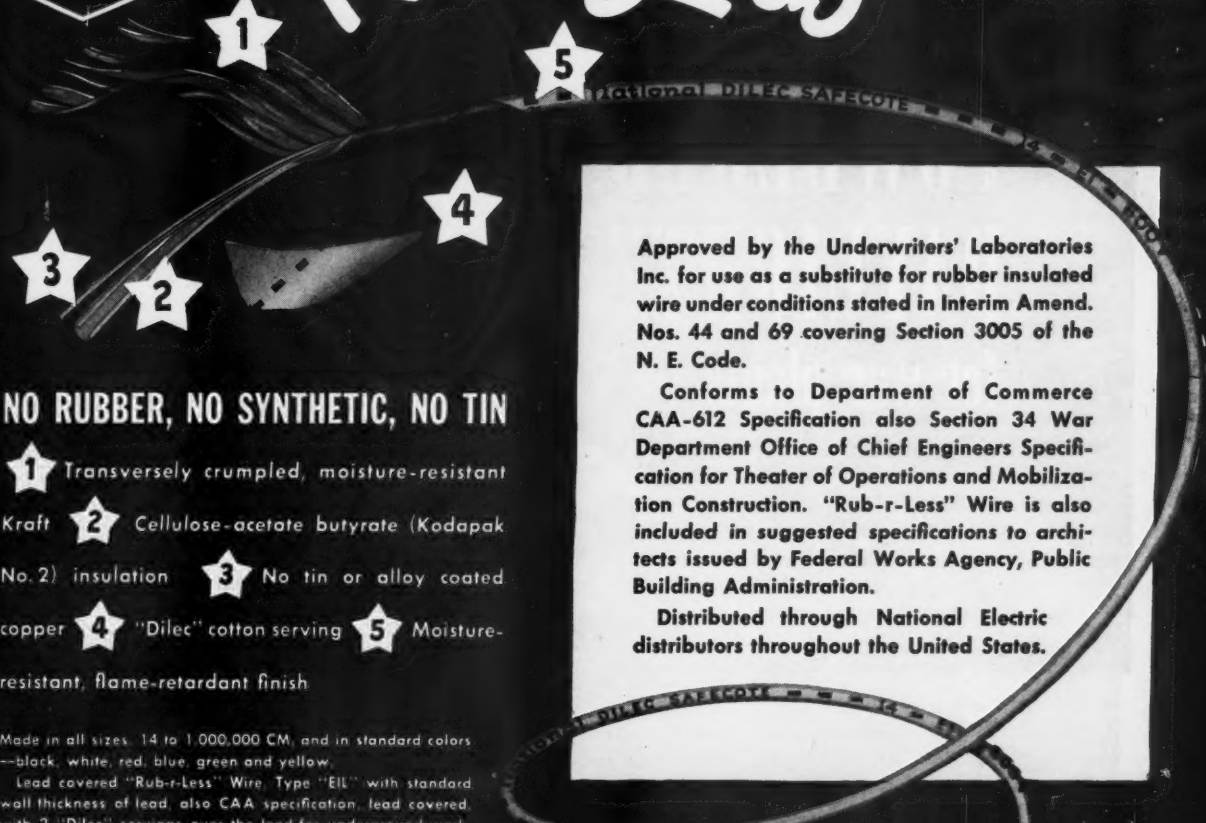
Name_____ Position_____

Company_____

City_____ State_____

MOTORS • TRANSFORMERS • BRIDGE BRAKES

NEW "Rub-Less" WIRE



NO RUBBER, NO SYNTHETIC, NO TIN

1 Transversely crumpled, moisture-resistant Kraft 2 Cellulose-acetate butyrate (Kodapak No. 2) insulation 3 No tin or alloy coated copper 4 "Dilec" cotton serving 5 Moisture-resistant, flame-retardant finish

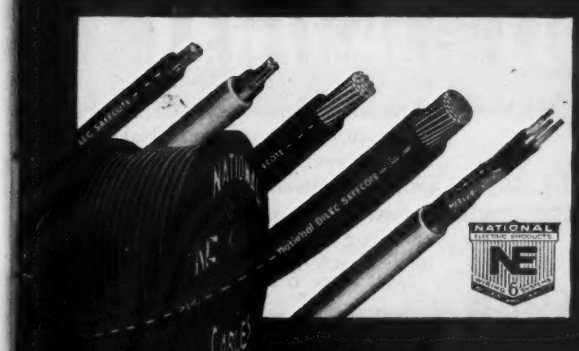
Made in all sizes, 14 to 1,000,000 CM, and in standard colors —black, white, red, blue, green and yellow.

Lead covered "Rub-r-Less" Wire, Type "EIL" with standard wall thickness of lead, also CAA specification, lead covered with 2 "Dilec" servings over the lead for underground work.

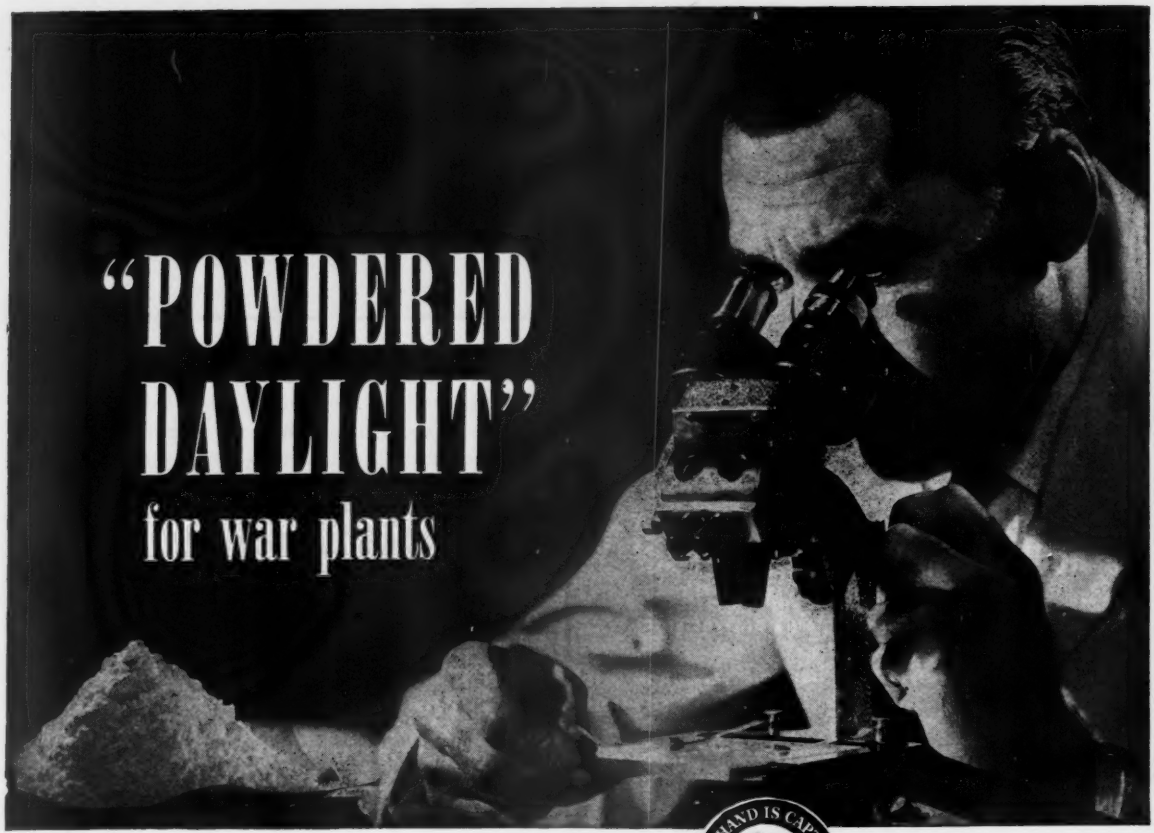
Approved by the Underwriters' Laboratories Inc. for use as a substitute for rubber insulated wire under conditions stated in Interim Amend. Nos. 44 and 69 covering Section 3005 of the N. E. Code.

Conforms to Department of Commerce CAA-612 Specification also Section 34 War Department Office of Chief Engineers Specification for Theater of Operations and Mobilization Construction. "Rub-r-Less" Wire is also included in suggested specifications to architects issued by Federal Works Agency, Public Building Administration.

Distributed through National Electric distributors throughout the United States.



National Electric
PRODUCTS CORPORATION
Pittsburgh, Pennsylvania



● A vital chemical of war is "powdered daylight" – fluorescent powder that makes cool, glare-free, shadowless light to speed production in plants throughout America.

Complex compounds called phosphors are pulverized, refined and milled to the fineness of face powder. Precisely blended and mixed with binders to assure even coating, phosphor crystals are *fixed* inside the glass tube by high-temperature baking. There, in low-pressure argon gas and mercury vapor, the "Black Light" magic of ultra-violet rays transforms phosphor energy into visible light more constant than daylight – and just as kind to the human eye.

THE HAND IS CAPTIVE TO THE EYE

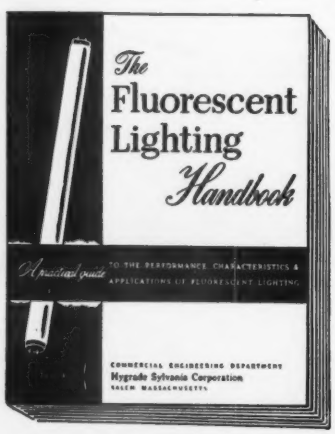
More than ten years of independent research have made coatings with smoother textures a unique feature of Sylvania Fluorescent Lamps. They have also brought other points of Sylvania Lamp superiority: uniform colors, higher light output and longer life – at progressively lower costs.

Improvements take place every week at Sylvania. Many of them, like the "Mercury Bomb," conserve strategic materials and labor, and at the same time improve quality. All of them serve fluorescent progress, which is aggressively aimed toward ultimate home illumination when Victory is won.

While today's Sylvania Fluorescent Lamps are serving three-shift days in America's war plants, tomorrow's are being made even better. Make a business asset out of the lamp improvements developed by this constant research. Make permanent customers by selling Sylvania Fluorescent Lamps for replacements and for change-overs.

KNOW FLUORESCENT BETTER

● "The Fluorescent Lighting Handbook" by Harris Reinhardt, of the Sylvania Commercial Engineering Department, is a practical guide to performance, characteristics and applications. Included in its 66 illustrated, letter-size pages are concise chapters on fluorescent principles, advantages, trouble-shooting suggestions and notes on lighting practice. Price: $1.00 with order. For your copy, write Dept. EC-2, Sylvania, Salem, Mass.



SYLVANIA

ELECTRIC PRODUCTS INC.

formerly Hygrade Sylvania Corporation
Salem, Mass.

Incandescent Lamps, Fluorescent Lamps, Fixtures and Accessories, Radio Tubes, Electronic Devices.

UMI

Guard Vital Circuits WITH CENTRAL RIGID STEEL CONDUIT

Vital circuits encased in CENTRAL RIGID STEEL CONDUIT are safe from deadly sabotage of shock, vibration, twisting, moisture and fumes.

CENTRAL'S consistent uniformity . . . accurate threading . . . easy workability are victory features at home as well as at sea. That's why CENTRAL has for many years been a favorite of the electrical industry . . . and will continue as the preferred conduit for vital circuits everywhere.

Sold by

SPANG CHALFANT, INC.

General Offices

GRANT BUILDING, PITTSBURGH, PA.

District Offices and Sales Representatives in Principal Cities

WOULD *You* HALF-RATION OUR FIGHTERS?

This pile, big as it is, contains *only half enough* scrap to run Youngstown's open hearth furnaces *one day.*

Imagine a pile 20 times this big and you know how much scrap it takes each 12-hour turn to keep all the steel mills going.

Each time this pile goes, another must be ready to take its place—twice a day, every day, until the war is won.

It's the dormant scrap you make available that will keep the nation's scrap pile up. If you slow down or stop your effort to find it and turn it in—if the mills have to do with one pile a day instead of two—then YOU must share the hazard of putting the boys in uniform on half-rations of steel!

THE YOUNGSTOWN SHEET AND TUBE COMPANY
Youngstown, Ohio

THROW YOUR SCRAP INTO THE FIGHT
YOUNGSTOWN

25-44E

SILVER MIRROR

GLASS REFLECTORS

SHARPEN VISION FOR FASTER WORK

Easy to get—now

Less-critical materials

Easy to install

Low-cost maintenance

Long lasting

Highly efficient

The smooth, controlled light from "X-Ray" Reflectors makes for speed, safety and accuracy with fewer rejections and less fatigue. Readily available, "X-Ray" Reflectors are made of highest quality silvered glass—the most efficient reflecting surface in commercial use.

There are "X-Ray" Reflectors to accommodate from 100-watt to 1500-watt incandescent lamps and the 400-watt Mercury Vapor lamp. The larger reflectors are for general high and low bay lighting and the smaller for local lighting such as over benches and in laboratories.

Our new industrial lighting booklet, Serial 2130, describes these units fully. Write us or your Curtis representative for a few extra copies to pass out to your best prospects.

CURTIS LIGHTING, INC.

6135 WEST 65TH STREET • CHICAGO, ILLINOIS

SERVICE AND ECONOMY WITH THE BRYANT FS4-NA "NO-BLINK" STARTER

"SURE-FIRE" THERMAL CUTOUT ELIMINATES BLINKING OF DEACTIVATED LAMPS AND SAVES CURRENT

TIME-PROVEN "GLOW SWITCH" LENGTHENS LAMP LIFE WITH PROPER PREHEAT AND PERFECT STARTS

FULLY AUTOMATIC

ADEQUATE PREHEATING of lamp electrodes provides perfect starts. Lamp life is prolonged as the vital emission material is not wasted by continued starting attempts. Starters do not wear themselves out with continued flashing. Ballasts last longer because overheating is prevented.

ANNOYING BLINKING is stopped immediately when the lamp becomes deactivated. When a worn out lamp is replaced, the starter functions at once—automatically. No cooling off period or reset of the starter is necessary.

Maintenance and replacement costs are reduced because these starters do not wear themselves out trying to start a deactivated lamp. Ballasts stay cool and last longer. Power is saved because the power is reduced to less than 1 watt when a deactivated lamp is locked out.

BRYANT
SUPERIOR WIRING DEVICES

THE BRYANT ELECTRIC COMPANY, BRIDGEPORT, CONN.
NEW YORK · CHICAGO · SAN FRANCISCO · LOS ANGELES

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Electrical Contracting

With which is consolidated The Electragist and Electrical Record . . . ESTABLISHED 1901

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A practical paper for electrical contractors, industrial electricians, inspectors, engineers and motor shops, covering engineering, installation, repairing, maintenance and management, in the field of electrical construction and maintenance.

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CHANGE OF ADDRESS

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Please change my address on Electrical Contracting

From .....

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To .....

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"Tomorrow may be too late—do it today!"...CHECK UP!

THIS

ELECTRICAL FAILURE HALTS WAR PRODUCTION

MIGHT HAVE PREVENTED

THIS

WARTIME restrictions make copper products hard to get — this includes electrical wire and cable. It will pay you to protect what you have.

Anaconda's Preventive Maintenance Plan will help you check to see that cables in your plant are not being abused.

If you follow this free plan you not only help yourself, but more important, you help the war effort. This manual provides a practical automatic method for complete analysis of circuits and equipment... uncovers potential weaknesses ... methods for correcting them ... with charts to enable quick periodic check-ups.

NOTE: Through this Preventive Maintenance Plan you may uncover the evidence necessary to obtain an "emergency repair priority." This is explained fully in the plan book. 49227

ANACONDA'S PREVENTIVE MAINTENANCE PLAN

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Electrical Contracting

PROGRESS IN SERVICE

Last month members of the National Industrial Service Association gathered in Cincinnati for a war conference. They came from all over the country to exchange ideas, to discuss new regulations and to work out better ways to gear their shops and facilities to the big job ahead.

There's a strong tradition of mutual confidence, or what we might call industry self-confidence among the motor shops. These men take pride in contributing the proceeds of their genius in shop methods and organization to their industry—even to competitors. Whether it's an improved coil winder, a clever gadget for creasing slot insulation, a better baking oven or a major reorganization of the small motor repair section, the complete details are soon in the hands of all the industry through correspondence, articles or meeting discussions.

And out of this tradition has come a strong foundation for the progress that this industry has made in these past few years. Mutual helpfulness, a ready willingness to share skill and methods, and a mature realization that the individual's fortune is closely bound to the respect his industry commands in the market place, are rare qualities. They take a high order of commercial wisdom as well as established industry ethics.

Commercial wisdom isn't easy to define. But it is easy to detect and isolate because it shows up in the books. It is evidenced by a healthy increase in net worth over a period of years. And the progress of the motor shops in shop methods, new machinery, efficient organization and in sound business practices are plainly apparent to every individual who has watched this industry grow.

Industry ethics are easy to define. But the real test is the confidence of the customer and the respect of those outside the industry. And we have a measure of that too. The recognition that the motor shop has received in priority standing, in PRP and now under CMP is in direct acknowledgment of its vital place in industrial America in wartime. And this is an acid test beyond the reach of promotion or influence.

In the coming year, the importance of a sound, well established industry devoted to the repair and maintenance of industrial and commercial electrical equipment is self-evident. What we have must be kept running for the duration, perhaps longer.

It is equally important that such a tradition of competent service be carried through the complex transition to a peace economy after the war. This is a great challenge. It's a problem worthy of our best minds.

In NISA we have a strong foundation. It has built substantially. It faces the future confidently because every step in its progress has been made with better service as a primary goal.

An actual example of the time-saving gains of the Graybar MM Plan*

The contractor for an important Mid-West ordnance plant had solicited bids on electrical supplies on a piecemeal basis, month-to-month. For each order, requisitions went from the engineering department to the purchasing department, which in turn obtained prices from a number of different sources, and finally let the contract with a plea for fast delivery. In the meantime, several weeks time were lost, and no plan for scheduling deliveries could be developed.

Working with the project engineer to speed up delivery, GRAYBAR proposed that bids for material be sought on an "all-that's-needed" basis, covering the period of construction of the entire project. Then, items could be obtained as needed from a continuous source of supply.

The proposal was adopted, and GRAYBAR'S quotations proved that no sacrifice of economy was necessary in instituting the new purchasing plan. The balance of electrical supplies for the job were delivered *as needed* by GRAYBAR. Delivery delays were cut, record-keeping was simplified, and the contractor expressed himself as "entirely satisfied".

In other cases, purchasing is done on "open order", without securing estimates, again at no sacrifice in economy, and with an appreciable saving in time.

***Serving as your MATERIALS MOBILIZER**

. . . on electrical supplies, GRAYBAR makes its procurement experience a part of your war production facilities. In less than one hour, your GRAYBAR Procurement Adviser can review the *four-point plan* which "dovetails" your electrical needs with the available production of more than 200 electrical manufacturers, distributed locally from more than 80 warehouses. Why not call him about it today?

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Everything Electrical . . . . THAT IT TAKES TO WIN!

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LIGHTING *is an essential part of the war production process. Substitute materials and metal economies will not interfere with essential illumination.*

Saving Metals in FLUORESCENT LIGHTING

Non-metallic reflectors and new ballasts are cutting down critical metal needs without lowering lighting standards.

UNDER the control of Limitation Order L-28, cutting the variety of lamps in production, and Limitation Order L-78, controlling the manufacture and distribution of fluorescent lighting fixtures, the electrical industry is cutting its consumption of critical materials. With the cooperation of the War Production Board these economies are being carried out with careful consideration of their relation to the over-all war program.

In the national scene, the quantities of steel required for fluorescent fixture reflectors is not great, but worth saving if it can be done without impairing the essential function of lighting equipment now being produced. Consequently, the limitations now imposed are in the direction of practical economies which can be carried out without cutting essential lighting standards and making the best possible use of the critical materials which can be used.

There is, of course, a responsibility beyond the letter of the rules upon everyone concerned with lighting whether in new plants or the relighting of existing structures and that is to exercise the collective ingenuity of the industry toward the job of getting the most effective light into the wheels of production with the minimum drain on metal resources consistent with the total war program.

Those who have the responsibility for the design, layout and installation of fluorescent lighting systems have a direct interest in the provisions of Limitation Order L-78 as amended. This order placed restrictions on the design, assembly and sale of industrial and non-industrial fluorescent lighting fixtures.

Briefly, the order bars the use of metal reflectors on fluorescent lighting fixtures with several exceptions, and sets up rules regarding sale and delivery as follows:

1. Fixtures and parts may be sold by manufacturers to distributors and contractors for resale.

2. Fixtures may be sold to the Maritime Commission, Navy Department, War Department, Metals Reserve Company, War Shipping Administration or any corporation organized under Section 5(d) of the Reconstruction Finance Corporation Act.

3. Fixtures manufactured before June 1, 1942 or from block inventory may be sold on an order bearing a preference rating of B-2 or better.

4. Fixtures manufactured after June

first, 1942 may be sold on A-1-j or better, component parts may be sold on A-1-j or better on any PRP rating.

Metal reflectors may be used up from blocked inventory as long as they are available. They are also permitted for mercury vapor lamps including the new 3000-watt tube and for fixtures for hazardous locations.

Lighting fixture manufacturers, together with WPB experts and manufacturers of non-metallic boards tackled the job of producing non-metal reflectors which would have not only the minimum essential characteristics but which would have substantial physical strength to withstand the normal rough handling of assembly, installation and maintenance. The reflection characteristics also had to be in line with the highly efficient metal reflectors since a significant loss in lighting efficiency would seriously counter-balance the saving in critical reflector materials.

The new non-metal reflectors now available represent many months of research and development preceding the limitation order requiring the elimination of metal. They are substantially formed from tough fibreboard, such as Masonite, synthetic resin-bonded plywood, molded or laminated asbestos, etc. Further experiments and tests with various finishes have developed a baked enamel reflecting surface that is hard, durable, and highly efficient and claimed to be equal to porcelain enameled metal. Progress and experience will probably bring further improvements, however, the non-metal reflector now available while offering an excellent wartime substitute, may make a strong bid for post-war recognition on its own merits.

While L-78 bars metal for reflectors it does not specify the materials which may be used. However, other wartime controls affect the manufacturing problems in several ways. For instance, heavy machine tools cannot be generally allocated for the production of non-metal reflectors since such a program might easily offset a substantial part of the savings in metal obtained by the substitution.

Consequently the industry has turned to the manufacturers of the reflector materials for some of the production and fabrication, converting existing machinery wherever possible to handle the non-metal components, and realigning assembly operations to fit the new materials.

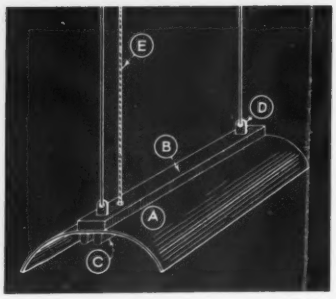
One manufacturer uses a reflector material for industrial lighting units of hard durable wood fiber composition material $\frac{1}{8}$-inch thick. The reflecting surface is a white baked synthetic enamel, tough elastic and resistant to peeling and checking. This surface is easily and safely cleaned with soap and water or any of the commonly used cleaners such as washing soda, naphtha, ammonia or tri-sodium phosphate. These reflectors are guaranteed and the manufacturer offers to resurface any which are found to deteriorate under normal service.

Another manufacturer uses a resin-bonded plywood reflector, three ply cross-grained plywood laminated with a synethic resin bond, molded under pressure to the required shape. The same material is formed into a wiring raceway limiting the use of metal to the ends of the raceway and the socket mountings. The reflector is finished with a high gloss synthetic lacquer claimed to have reflecting characteristics practically equivalent to enameled steel. Assembling and installing the completed fixture involves the same fittings and methods as those used with steel reflectors. This manufacturer claims that the new plastic unit can be safely guaranteed for any normal industrial installation.

Another manufacturer announces that his new reflector is one-third lighter in weight than steel, its reflection factor is 85 to 90 per cent, its over-all light efficiency is up two per cent and the finish is more resistant to corrosion.

Other economies in the use of steel go beyond the requirements of L-78. Short ballast housings with small wiring channels to the lamp holders is one example. Corner cutting economies in forming and bracing metal parts also saves small quantities of metal. Another important factor in the conservation of critical materials are the restrictions on lamp sizes and types under Limitation Order L-78.

[Continued on page 115]



METAL ECONOMIES *are carried out with minimum effect on efficiency and strength.*

A—Wood fibre, asbestos and plastic forms replace reflector steel under L-78. Open end design standardized. Reflector finishes have reflection characteristics of 81 to 88 per cent. Metal reflectors still allowed on certain types such as explosion proof.

B—Four lamp ballasts on 4-100 watt lamp hook-ups save ballast metal by a sequence starting circuit. Ballast housings and wiring channels on some types are reduced in size. Non-metal wiring channel available in one line of fixtures. These economies are not required under L-78.

C—Lamp colors limited by L-28 to daylight and white. Others available only from existing inventory.

D—Minor economies in fastenings and hardware are mostly trimmed from non-essential or decorative features. Not mandatory under L-78.

E—Flexible cord fixture drops to reduce conduit requirements. Tubing may be used where exposed to mechanical injury.

COEFFICIENTS OF UTILIZATION

Ceiling		75%			50%			30%	
Walls		50%	30%	10%	50%	30%	10%	30%	10%
Room Index	J	38	32	28	37	32	28	32	28
	I	47	42	39	46	41	38	41	38
	H	51	47	44	50	47	44	46	44
	G	55	51	48	54	51	48	49	48
	F	59	55	51	57	53	51	53	51
	E	64	60	57	62	59	57	58	57
	D	68	65	62	66	64	61	63	61
	C	70	67	64	68	66	64	65	63
	B	73	70	68	71	69	67	68	66
	A	75	72	70	73	70	69	70	68

COEFFICIENTS OF UTILIZATION

Ceiling		75%			50%			30%	
Walls		50%	30%	10%	50%	30%	10%	30%	10%
Room Index	J	37	33	30	37	33	30	33	30
	I	46	42	40	45	42	39	42	39
	H	50	47	45	50	47	45	46	45
	G	54	51	49	53	51	49	49	48
	F	57	54	51	55	53	51	52	51
	E	61	59	56	60	58	55	57	55
	D	65	62	60	64	61	60	61	58
	C	67	64	61	65	62	61	62	61
	B	69	67	65	67	65	64	65	64
	A	71	68	66	69	67	65	66	65

COEFFICIENTS OF UTILIZATION

Ceiling		75%			50%			30%	
Walls		50%	30%	10%	50%	30%	10%	30%	10%
Room Index	J	39	33	29	38	33	29	32	29
	I	48	43	40	47	42	39	42	39
	H	53	49	45	51	48	45	47	45
	G	57	53	49	56	52	49	51	49
	F	60	56	53	59	55	52	54	52
	E	65	62	58	64	61	58	60	58
	D	70	66	63	68	66	63	65	63
	C	72	69	66	70	67	66	66	65
	B	75	72	70	73	71	69	70	68
	A	77	74	72	75	72	71	71	70

COEFFICIENT OF UTILIZATION *tables for three standard types of non-metallic reflector industrial lighting units.*

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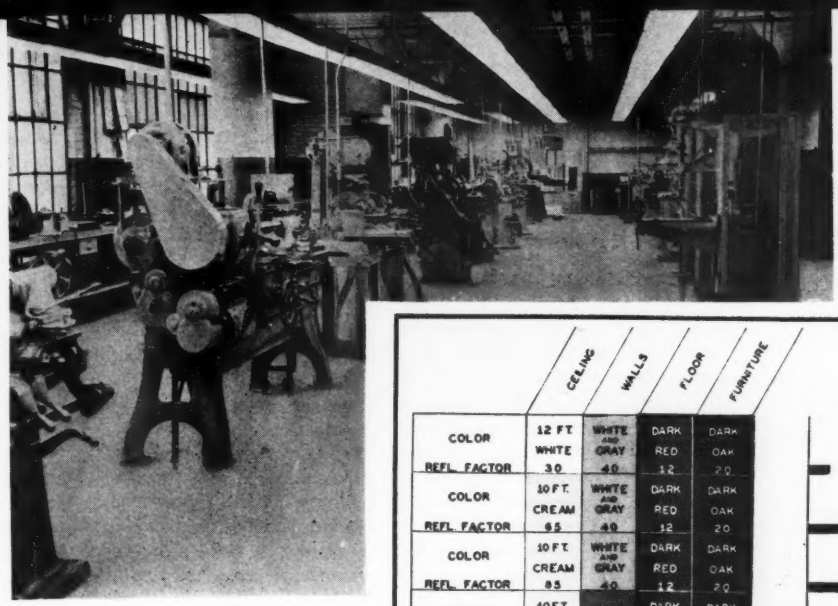
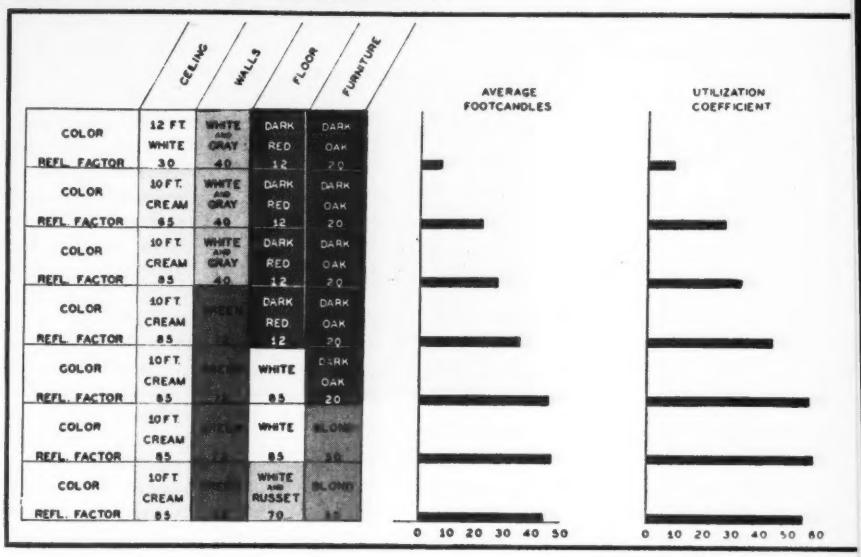


LIGHT REFLECTING *gray paint on this shop floor makes illumination "bounce" back. Utilization of light paint on floors, walls and ceilings.*

EFFECT OF COLOR *on the coefficient of utilization of the test installation described in the text.*



SALVAGE Waste Light

By scientific selection of colors and reflecting surfaces effective illumination is increased

BY means of a scientific use of color, according to a series of experiments conducted by A. A. Brainerd, Philadelphia Electric Co., and R. A. Massey, E. I. duPont de Nemours Co., it is practical to increase the illumination from most lighting systems 100 percent without changing lighting equipment or wattage.

The present commonly-used methods of calculating the performance of a lighting system were introduced previous to World War I, at a time when there were no instruments available for the rapid and accurate measurement of the illumination and brightness, and when relatively little was known of the illumination properties of paint. Illumination was measured in terms of lumens per square foot falling on an arbitrary plane, usually horizontal and 30 inches above the floor. The area in square feet of this plane, multiplied by the illumination in foot-candles, gives the number of useful lumens. This figure divided by the rated lumens of the lamp or lamps, is called the coefficient of utilization. By this method, if we had a room of 100 square feet in area, lighted by a 500-watt (10,000 lumen) lamp, the utilization coefficient would be 50 percent if the illumination is 50 foot-candles, or 100 percent if the figure is 100 foot-candles. Presumably, a lighting engineer who could produce 100 foot-candles under these conditions would have achieved perfection and should look for other worlds to conquer. Strangely enough 100 percent utilization is not difficult of achievement. There are actual installations which if we start with the light output of the luminaire instead of the lamp exceed 100 percent. Utilization coefficients as high as 125 percent have been secured.

The explanation of this phenomena is quite simple. A lumen doesn't close its eyes, turn up its toes and die merely because it has fallen on a working plane. In fact, if given half a chance it will bound back and try again and again. Theoretically, a 10,000 lumen lamp could produce several hundred foot-candles on the working plane in our 100 square foot room. Professor H. H. Higbie in his "Lighting Calculations" shows a table of maximum theoretical utilization factors for various reflection-factors in an ideal room. For 98 percent reflection, the utilization is 5000 percent. From this it appears that our 100 percent utilization is actually only two percent of the ideal. Surely this is not too high a target for us to shoot at!

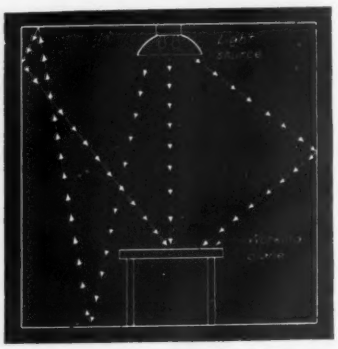
Admittedly, 100 percent utilization requires careful planning, but the goal to be achieved is worth considerable effort. Let us take the case of a typical manufacturing area with an area of 40 by 100 feet and a height of 12 feet. Assuming 70 percent reflection for the ceiling and 30 percent for the sidewalls, with direct type industrial lighting equip-

From a paper prepared by Arthur A. Brainerd and Robert A. Massey for the Wartime Lighting Conference of the I.E.S.

ment we would expect a utilization of 40 percent according to commonly accepted lighting tables. This includes an estimated depreciation of 30 percent. Such a system would require 48 500-watt incandescent luminaires, or 114 two-lamp fluorescent units with 40-watt tubes, to produce 50 foot-candles.

The calculations above are based on the assumption that no light is turned from any surface except ceiling and upper sidewalls. Roughly, this is about 40 percent of the surface, available.

Now let us consider the steps necessary to raise this illumination from 50 foot-candles to 100 foot-candles, with no increase in power consumption and with no change in equipment.



ROOM SURFACES *reflect or absorb light in varying degrees. High reflection-factors keep lumens "bouncing" and add to useful light.*

Let us start in then by refinishing the ceiling with a high-grade white or light ivory paint, preferably having an eggshell or matte finish. It should be possible, with present finishes, to maintain an 80 percent reflection-factor.

Next, refinish the sidewalls with a slightly darker paint such as light green, with a 65 percent reflection.

Third, refinish all horizontal surfaces, benches, floors, tables, etc., in a paint of at least 40 percent reflection-factor.

Fourth, give all machines a standard "3-dimensional" finish.

Now, assume that each luminaire emits 7000 lumens or 70 percent of lamp-lumens. Of these 7000 lumens, 40 percent or 2800 will be returned by the floors and benches. The rebound from the ceiling will be 80 percent of 2800, or 2240, which is returned to the working plane. Note that in the complete cycle of reflection, we have recovered 8 times .4, or 32 percent of the light striking the working plane. The complete sequence would indicate a utilization of 101.86 percent. This assumes that reflection from both floor and ceiling is perfectly diffuse and that all light from the luminaires goes directly to the floor. This condition is frequently achieved in large offices and manufacturing areas, and would be very closely approximated in the room under consideration. If the room should be relatively narrow the rebound from the sidewalls would, of course, be less than the direct light flux in the larger room.

It is quite possible by planned use of all available reflecting surfaces, to get at least 100 percent more light for each watt consumed than is now the general experience. This result can be achieved with no change of equipment. Not only can it be achieved initially, but it can be maintained.

The application of these principles necessitates considerably more detailed planning than we have been accustomed to. In order to demonstrate their practical application, a test room was selected whose dimensions are particularly unfavorable to a high light utilization. The room was 11 feet 4 inches by 22 feet, with a 12-foot ceiling. The lighting was from two 16-in. enclosing globes each equipped with a 300-watt lamp, and giving a utilization coefficient of 22 percent. In order to eliminate the fixture as variable, the original enclosing globes were replaced by two 500-watt silvered-bowl incandescent lamps on 18-inch drop cords. In a room of these proportions, excessive brightness at the neck and upper part of the lamp was not a factor. The room index for indirect lighting is given in the current tables as G. For indirect lighting the highest coefficient of utilization is given as 25 percent.

The first step in the transformation was to install a suspended ceiling 10 feet high, and finish it with light cream paint giving a reflection-factor of 65 percent, resulting in a light utilization of 27 percent, which is very close to the calculated value of 25 percent.

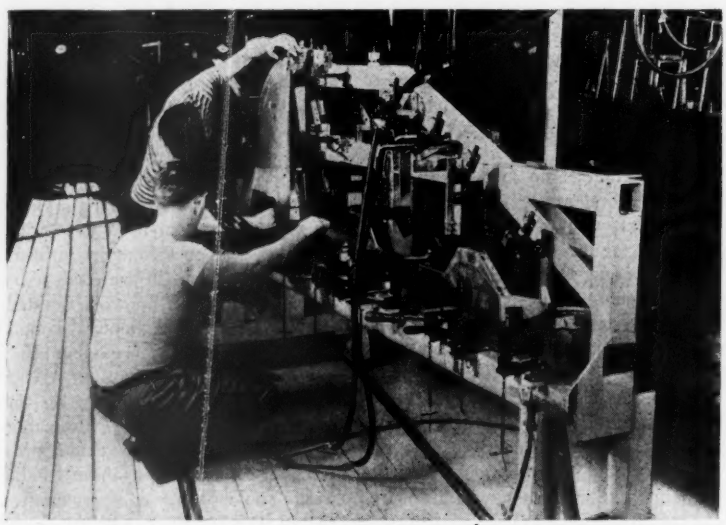
In the second step, the ceiling was repainted with a lighter color, bringing the reflection-factor up to 85 percent. The resultant coefficient of utilization was 33 percent, an increase of 22 percent.

The third step consisted in finishing the side walls with a neutral green paint slightly on the yellow side in hue, and having a reflection-factor of 72 percent. The original finish had a reflection value of 40 percent, and the gray dado a reflection-factor of 12 percent. This change resulted in an improvement in room utilization of from 33 to 44 percent. The men working in this room found the changed color scheme quite comfortable. There was no adverse comment.

The fourth step was to refinish the dark maroon floor which had a reflection-factor of 12 percent, with white deck paint having a reflection-factor of 85 percent. This resulted in a room utilization of 56.1 percent.

The fifth step was to replace the dark mahogany table and chairs with blond furniture having a reflection-factor of 50 percent. This step resulted in a light utilization of 58.5 percent, an increase of 113 percent over the original set up.

The sixth step was to stipple the white floor with russet, the approximate complementary color of the green used on the sidewalls. The resultant reflection-



LIGHTING *underparts of planes under construction, an illumination problem, was solved by painting the floor of this assembly line in a light color. The reflection factor of the gray floor is 60 percent, much higher than has previously been thought practical.*

UMI

factor was 70 percent, and the room utilization was reduced to 55 percent. Note that the light utilization in this final case is exactly 100 percent improvement.

Since the room was used as a classroom for several groups of mechanics, there was an adequate opportunity to get a frank opinion from men who did not hesitate to speak their minds. They watched the experiments with interest and were unanimous in their approval of the final arrangement. At their request the final experimental arrangement was made permanent.

The above simple set of experiments demonstrated three things:

1. Satisfactory hues may be secured without sacrifice in reflection properties.
2. Floor and table finishes of 65 percent reflection-factor or even higher, are practical.
3. Coefficients of utilization of the order double the present practice can readily be secured by the use of high-reflection floor finishes of suitable hue.

In order to determine the everyday workability of these principles, several defense plants were contacted and arrangements made for large scale installations. In the repair machine shop of the Philadelphia Electric Company, with a grey flooring having a reflection-factor of 60 percent, the change greatly improved the ability to work at the various machine tools, particularly when brass and copper were being fabricated. On the sewing tables at the Marine Corps Quartermaster Depot, the combination of neutral green machines and light cream tables increases the illumination at the needles over 100 percent. On an assembly line at Fleetwings, Inc., light colored floor and table finishes give good visibility on all sides of parts under construction.

These are all areas where light-colored surfaces below the horizontal have been of value in the war effort.

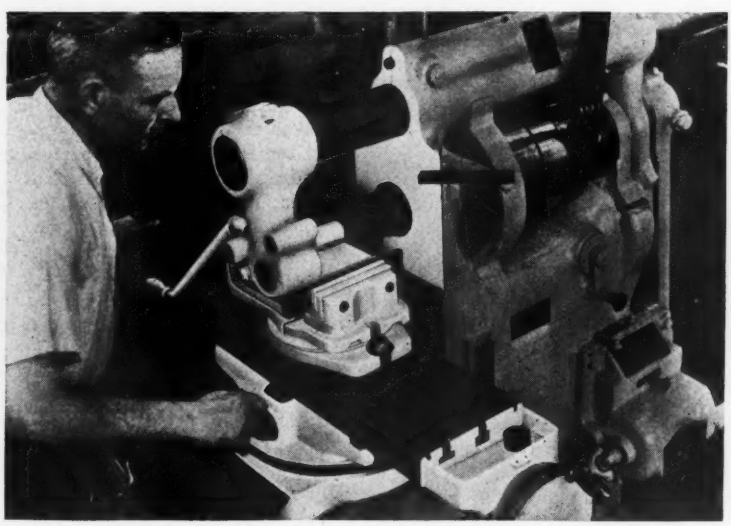
From a consideration of the above investigations, it is apparent that only by the use of interior finishes having a very high reflection value (60 percent or higher) can we expect to attain a maximum utilization of light. This applies to floors, furniture, machinery, and benches, as well as ceiling and side walls. From this it is apparent that adequate contrast for efficient and comfortable vision must be obtained through more of a contrast in "Hue" than in "Brightness." This applies to every surface which comes within our normal line of vision. From the standpoint of visibility, the working area and its immediate surroundings call for the most careful study.

From the very nature of the case, it is evident that there can be no "one" best answer to the color problem. After an extensive series of tests, Spotlight Buff was selected as the working color for machine tool operations on ferrous metals. Experience has shown that this color is not only satisfactory for the purpose for which it was designed, but for many other operations as well. However, there have been a sufficient number of demands for other hues to justify a more extended study of the whole painting problem. Briefly, our problem is one of selecting a color of high reflection value, having a satisfactory contrast in hue with the material being manufactured, and a color that will be continuously stimulating and comfortable to the workers. And the cumulative result of having all surfaces of high reflection value is to bring out a marked increase in light utilization.

The function of color as a part of the industrial seeing machine is to provide a controlled mild stimulation and to increase visibility by means of suitable contrast. Brilliant colors such as bright red or yellow, stimulate impulsive action and have their place as danger and caution indicators. Under such conditions, pronounced stimulation is deliberately produced in order to get instant action. Preventive action must be instantaneous if accidents are to be reduced. Achromatic colors (in other words, gray) have a deadening effect if used to the exclusion of chromatic colors, i.e., those having hue and chroma characteristics. Somewhere in between strong chromatic color and achromatic color lies the position of continuous, comfortable, accurate vision with a minimum of fatigue. The need of the correct degree of stimulation within the working area cannot be disputed. It is equally essential, however, that the hue and brightness of the surroundings, including floor and ceilings, must be of such character as to emphasize a return of the eyes to the working area and to have their greatest comfort while there. In addition, these areas should have an adequate reflection value to insure the maximum use of multiple reflections. When all this is carefully worked out it is possible to work continuously and comfortably over floors having a reflection-factor of over 80 percent.

The investigation here described should be considered as a record of progress rather than the ultimate solution. We believe that we have, however, established the following as facts:

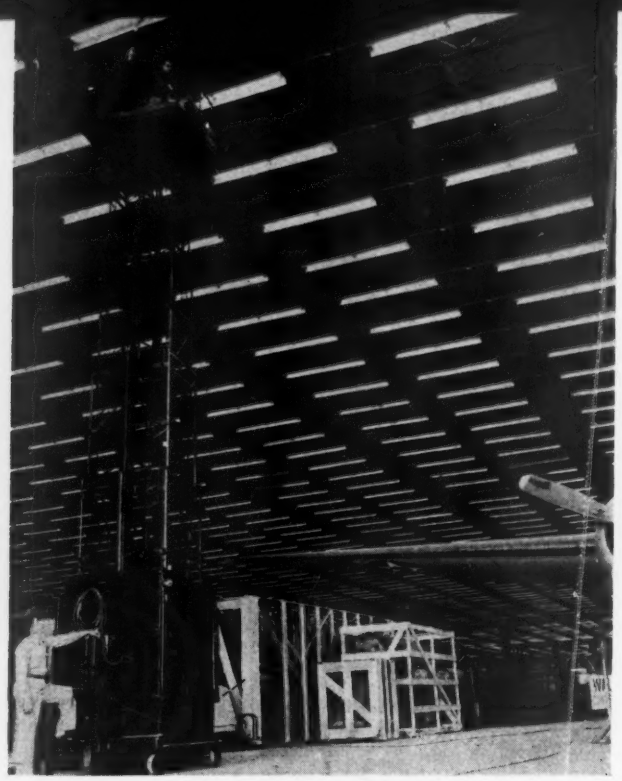
1. That carefully selected hue contrast will effectively augment brightness contrast for comfortable, accurate, continuous vision.
2. That it is quite feasible to use much higher reflection-factors on floors and walls without discomfort, than has hitherto been considered possible.
3. That the use of color does not necessarily mean a great sacrifice in reflection-factor.
4. That the use of multiple reflections above makes possible a degree of light utilization far in excess of existing experience with a reduction in the need of critical materials and an increased return from the electric power used.



MACHINERY BODY *painted Horizon Gray and the working surfaces with a contrasting hue, Spotlight Buff, causes the material being worked to stand out in sharp contrast with machinery and surroundings.*

SPEEDING

Inaccessibility has long inhibited adequate lighting maintenance. Here are some ideas on speeding up this phase of light conservation.



TELESCOPING *platform, electrically operated raises maintenance crew to convenient and safe access to lighting units.*

WARTIME emergencies are teaching us to conserve everything we can. Industry, among other things, is striving to get every available foot-candle of illumination out of its present lighting equipment. Salvaging of waste light through the scientific use of paint on building interiors and machinery has been covered in a preceding article. The lighting fixture itself presents another means of effectively salvaging light. Dirty reflectors have been known to cut light output as much as 50 percent.

In the past, too little attention had been paid to lighting fixture maintenance. Of course, lamps were replaced when burned out. In many cases that was the extent of the maintenance for cleaning was a time consuming chore. Much of this lax attitude was undoubtedly due to inaccessibility of the units. Various types of fixture disconnect devices simplity this. But unless drop hanger assemblies are employed the men must still have access to the units. The logical solution to this problem is: "If you can't bring the fixture to the maintenance man, bring the man to the fixture." That is just what numerous industrial plants are doing today, through the development and use of rolling scaffolds, crows' nests, catwalks, and other devices. Some of these ideas, already in practice, are outlined here.

High bay lighting presents the toughest maintenance problem. In most cases the units are mounted 20 to 30 feet above the ground. Where the units were not equipped with drop hanger assemblies the schemes employed include:

1. *Traveling Crane Platform*—Where clearances permit, platforms are mounted on top of the hoisting truck that rides the bridge of traveling cranes. Where clearances are small, this platform can be suspended from the side of the hoist truck. In either case a safety switch controlling both the movement of the bridge and hoist prevents the crane from moving while a man is working on the platform.

2. *Crane Bridge Catwalk*—In many cases a catwalk mounted to the side of the crane girder and extending the full length of the bridge, will do the trick. In this case, more than one maintenance man can service a row of units parallel to the crane bridge, thus cutting down the servicing time.

3. *Service Bridge*—Where a crane bridge catwalk is not practical, a service bridge, towed by the traveling crane and riding the same rails, is used. A large western plane manufacturer finds this the solution to his lighting maintenance problem.

4. *Monorail Service Cage*—Another feasible method is to mount monorails in line with rows of lighting units in high bays. A suspended cage provides the working platform for this maintenance scheme.

5. *Roof Truss Catwalks*—An old established method is to install catwalks in the roof trusses and parallel to rows of fixtures. This, of course, is practical only when the units are mounted above the bottom chord of the trusses.

6. *Crows' Nests*—These over-hanging, revolving, aerial extension ladders can be mounted on caster trailers, electric platform trucks or auto truck bodies. Permits reaching units over machines and other equipment.

Low Bay Lighting

Low bay lighting lends itself quite readily to maintenance from the floor. To increase fixture accessibility, numerous types of ladders and portable platforms are used. Schemes that have been tried and tested include:

1. *Portable Scaffolds*—These are used to maintain lighting units mounted up to a maximum of 15 feet from the floor. They may be either of the stationary or elevator type platform. One western engine manufacturer has included a spare parts cabinet, tool drawer and work bench as an integral part of the base of a portable maintenance platform. The platform itself contains a test set for fluorescent lamps and a rack to hold an industrial fluorescent unit. The cabinet shelves hold a carton of 24, 40-watt fluorescent lamps, spare starters, sockets, ballasts and other maintenance items.

2. *Portable Bridge Catwalks*—One western plane manufacturer is using a portable bridge catwalk, nine feet long, two feet wide and of sufficient height to reach the lighting units. This equipment can be rolled down the factory aisles, bridging the machines between the aisles. A ladder at each end of the catwalk enables the maintenance man to

[Continued on Page 80]

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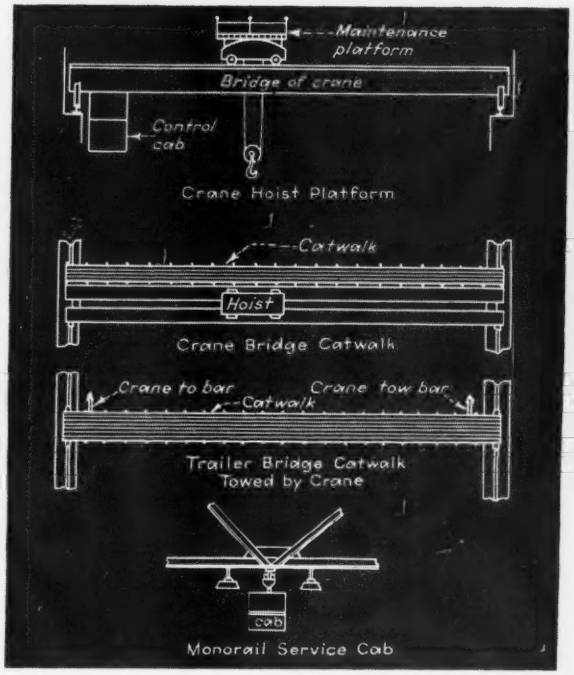
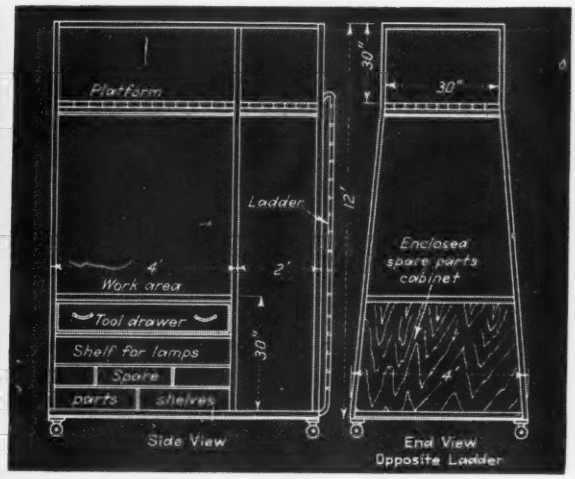
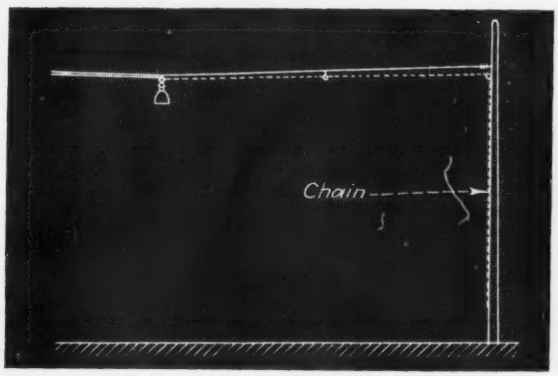
LIGHTING MAINTENANCE



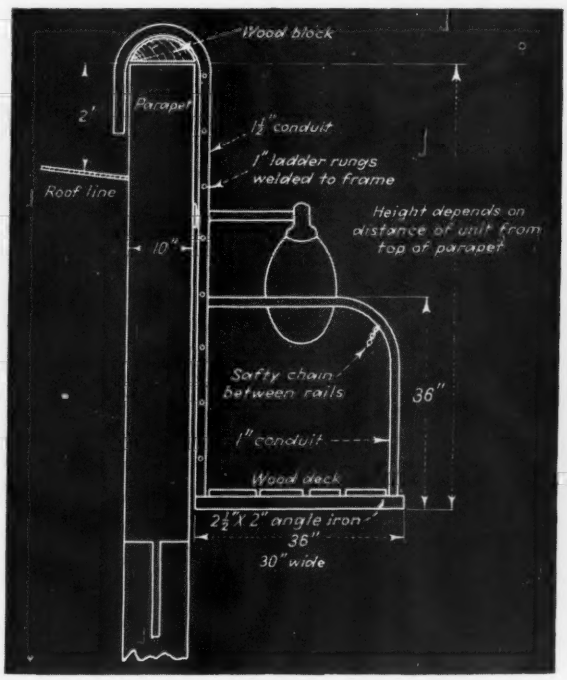
CRANE PLATFORMS, *trailers, catwalks and monorail service cabs are examples of convenient access methods.*



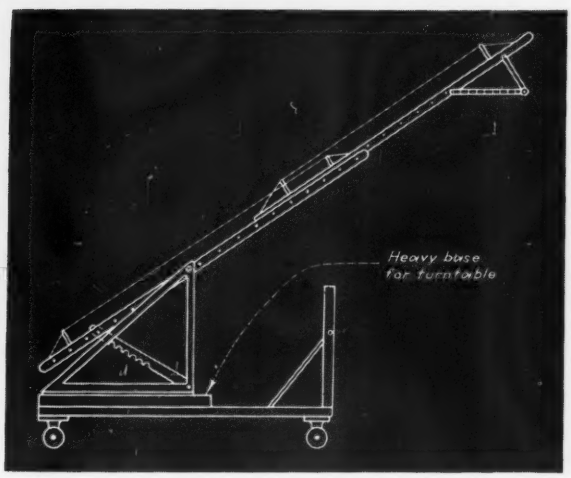
MAINTENANCE SCAFFOLD *and spare parts truck are especially useful in clear areas of moderate height.*



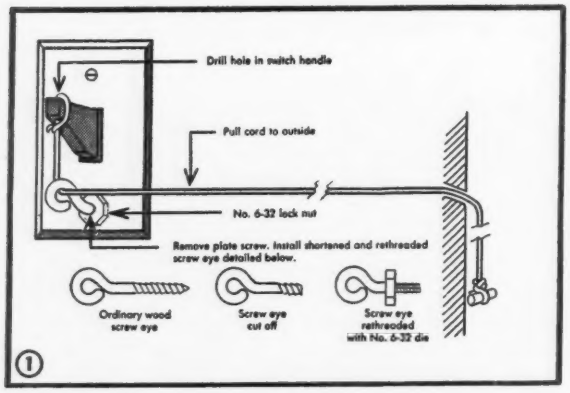
DISCONNECTING *suspension with chain and pulley allow lighting units to be dropped to floor for maintenance.*

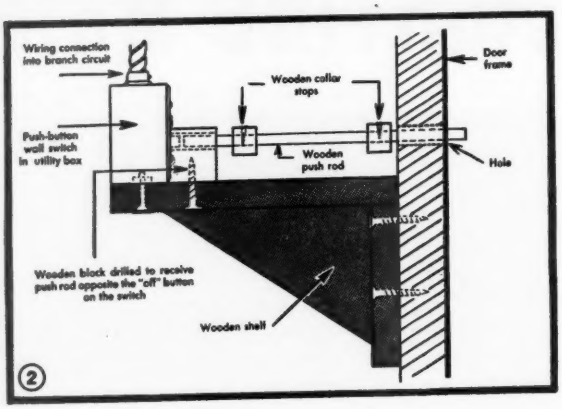


PARAPET *ladders for reaching outside lights hook over wall and provide a solid working platform.*



CROWS NEST *extension ladders on turntable and hand truck allow maintenance men to work above machinery.*


Drill hole in switch handle
Pull cord to outside
No. 6-32 lock nut
Remove plate screw. Install shortened and rethreaded screw eye detailed below.
Ordinary wood screw eye
Screw eye cut off
Screw eye rethreaded with No. 6-32 die
1


Wiring connection into branch circuit
Door frame
Wooden collar stops
Push-button wall switch in utility box
Wooden push rod
Hole
Wooden block drilled to receive push rod opposite the "off" button on the switch
Wooden shell
2

BLACKOUT CONTROL of STORE LIGHTING

Exterior control of commercial lighting is vital during a blackout. Here are ten simple ways of doing this without using critical materials.

"Lights Out" is a mandatory rule when the air raid sirens scream. Store owners in areas not yet subject to permanent dimouts or complete blackouts may still capitalize on electric advertising, show window lighting and maintain night lighting as a precaution against entry, provided they have means of extinguishing these lights in case of a blackout.

Chicago, like many other cities and municipalities, has an ordinance regulating the use of commercial lighting during a blackout. Specifically, it states that all lighting visible from the exterior must be turned out within five minutes after the first air raid siren sounds. Violation of this ordinance carries a $200 fine or six months imprisonment.

Realizing the effect of this regulation on its commercial customers, Commonwealth Edison Company engineers designed and suggested a number of non-technical and inexpensive methods of store lighting control. Prepared in a booklet form by the electric utilities in the Chicago area and approved by the Office of Civilian Defense of the Chicago Metropolitan area as an advisory measure, these methods have been incorporated in a utility-contractor campaign to help Chicago merchants comply with the ordinance.

The city is divided into some 50 districts and utility men and contractors make store-to-store calls after informing the local block captains. To date, some 543 installations have been made by 33 cooperating contractors. In addition, 927 estimates are in the hands of merchants pending decision. And this drive is still going strong. Jobs run from $6 to $40 or more per store, depending upon the complexity of the

[Continued on Page 119]

DIAGRAM 1. *Tumbler switch control by means of a pull cord accessible at store exterior. Can be used to control a night light, show window lighting or electric sign. If present switch is not accessible, a new switch can be conveniently located and inserted in the lighting circuit.*

DIAGRAM 2. *Push-button switch control mounted on a shelf near store front. Switch is so connected that it will turn off the lighting circuit. Can be substituted for scheme (1) where this method proves to be more convenient. Practical length of operating rod limits its application.*

DIAGRAM 3. *Pull switch control is provided by small sand bag which drops when pin release is pulled by exterior pull cord. The mechanism must be reset before light can be turned on again. This is particularly suited to small one-unit window lights, window signs and night lights.*

DIAGRAM 4. *Safety switch control through direct pull cord or latch operated drop weight mechanisms. Switch must be near store exterior in first method. When weight method is used the latch board should be extended out from wall beyond switch handle to give forward and downward pull.*

DIAGRAM 5. *Electric sign control by means of a pull cord on plunger of sign switch or a "shorted plug" inserted in the sign circuit. The "shorted plug" scheme is outlined more fully in Diagram 6. Where signs are controlled from store interior, other methods outlined here are applicable.*

DIAGRAM 6. *Shorted plug used as a one-way switch. The terminals of the plug cap are connected by a short length of No. 12 wire. A heavy piece of twine or rope attached to plug acts as pull cord. When plug is pulled out of receptacle it breaks the circuit. For use indoors only.*

DIAGRAM 7. *Two methods of applying the "shorted plug" to window lighting. Method "A" is for control of a complete circuit of window lights with the receptacle connected in series with the circuit. Pull cord goes to store exterior. Method "B" shows plug inserted in single fixture canopy.*

DIAGRAM 8. *Night lighting by means of a reflector floodlight located near front of store and projected toward the rear. Exterior control is provided by a receptacle mounted in the fixture canopy and connected in series with the night light switch. Shorted plug pull cord provides the blackout control.*

DIAGRAM 9. *Time switch control from an exterior location. Pull cord drop weight mechanism is employed with the weight attached to the existing manual control of the time switch. Pull on cord releases pin and weight drops, actuating manual control lever.*

DIAGRAM 10. *Remote control switches can be operated from the outside by one of the two methods shown above. Method (1) uses two momentary contact switches; one on the interior to throw remote control switch on; and one on exterior to throw it off. Method (2) uses ordinary tumbler switch with exterior pull cord as outlined in Diagram 1.*

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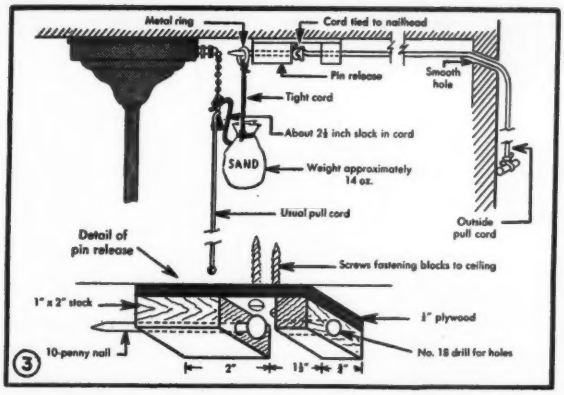
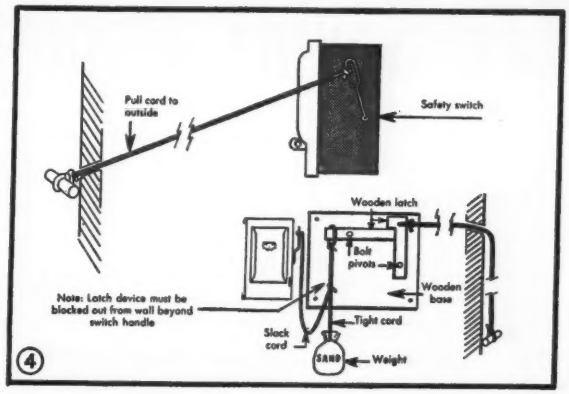
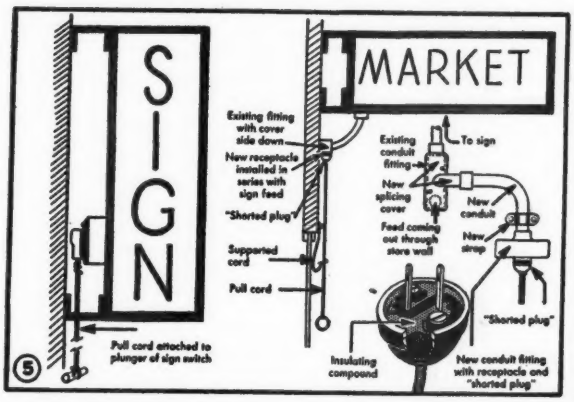
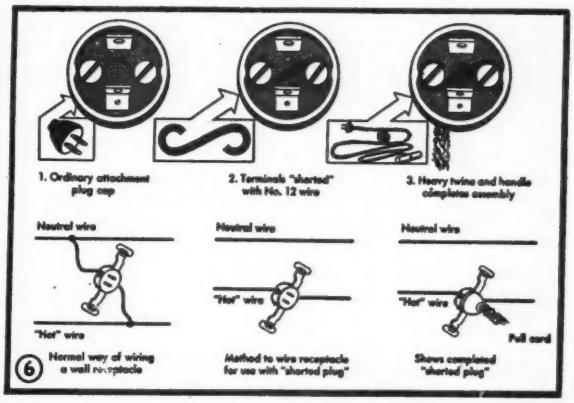
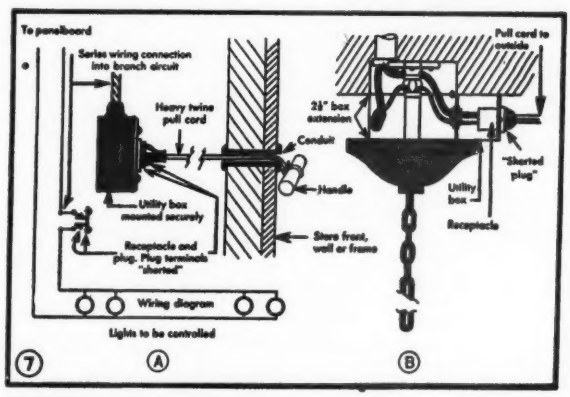
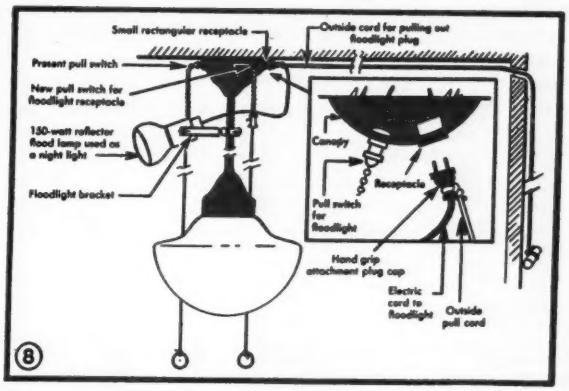

Metal ring
Cord tied to nailhead
Pin release
Smooth hole
Tight cord
About 2½ inch slack in cord
SAND
Weight approximately 14 oz.
Usual pull cord
Outside pull cord
Detail of pin release
Screws fastening blocks to ceiling
1" x 2" stock
¾" plywood
10-penny nail
No. 18 drill for holes
2"
1½"
3"
3

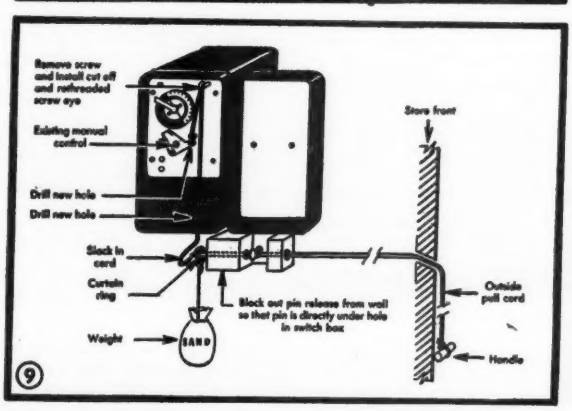

Pull cord to outside
Safety switch
Wooden latch
Bolt pivots
Wooden base
Note: Latch device must be blocked out from wall beyond switch handle
Slack cord
Tight cord
SAND
Weight
4

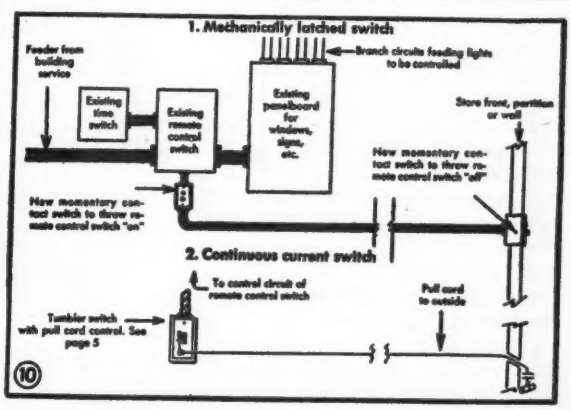

SIGN
MARKET
Existing fitting with cover side down
New receptacle installed in series with sign feed
"Shorted plug"
Supported cord
Pull cord
Pull cord attached to plunger of sign switch
Existing conduit fitting
To sign
New splicing cover
New conduit
Feed coming out through store wall
New strap
"Shorted plug"
Insulating compound
New conduit fitting with receptacle and "shorted plug"
5


1. Ordinary attachment plug cap
2. Terminals "shorted" with No. 12 wire
3. Heavy twine and handle completes assembly
Neutral wire
"Hot" wire
Normal way of wiring a wall receptacle
Method to wire receptacle for use with "shorted plug"
Shows completed "shorted plug"
Pull cord
6


To panelboard
Series wiring connection into branch circuit
Heavy twine pull cord
Conduit
Handle
Utility box mounted securely
Receptacle and plug. Plug terminals "shorted"
Wiring diagram
Lights to be controlled
Store front, wall or frame
2½" box extension
Pull cord to outside
"Shorted plug"
Utility box
Receptacle
7
A
B


Small rectangular receptacle
Outside cord for pulling out floodlight plug
Present pull switch
New pull switch for floodlight receptacle
150-watt reflector flood lamp used as a night light
Floodlight bracket
Canopy
Receptacle
Pull switch for floodlight
Hand grip attachment plug cap
Electric cord to floodlight
Outside pull cord
8


Remove screw and install cut off and rethreaded screw eye
Existing manual control
Drill new hole
Drill new hole
Slack in cord
Curtain ring
Weight
SAND
Block out pin release from wall so that pin is directly under hole in switch box
Store front
Outside pull cord
Handle
9


1. Mechanically latched switch
Feeder from building service
Existing time switch
Existing remote control switch
Existing panelboard for windows, signs, etc.
Branch circuits feeding lights to be controlled
Store front, partition or wall
New momentary contact switch to throw remote control switch "off"
New momentary contact switch to throw remote control switch "on"
2. Continuous current switch
To control circuit of remote control switch
Pull cord to outside
Tumbler switch with pull cord control. See page 5
10

Tax Saving Opportunities

What to do about your new tax deductions under the Revenue Act of 1942, by an analyst specializing in electrical contractors' accounting methods.

By Arthur Roberts

ALTHOUGH the Revenue Act of 1942 enacts the stiffest tax rates in history, it has liberalized certain older regulations.

You are now permitted a carry-back of operating losses for two years, which affords, in general, the same relief in periods of declining profits that the two-year carry-over of operating losses, previously legalized under the Revenue Act of 1939, affords in periods of increasing profits. Alone or in combination, the two-year carry-over and two-year carry-back of operating losses is a profit-stabilizer that the contractor should understand thoroughly because conditions during the war and postwar periods are certain to inject instability into business, hence, profits will peak and dip erratically. Under the carry-over and carry-back provisions, you are better able to survive such instability from a tax standpoint.

These provisions are so important that we detail the operations below. Suppose you show these net incomes and net losses over a period of years.

1941	$500 net income
1942	1,200 net income
1943	1,400 loss
1944	1,200 loss
1945	400 net income
1946	1,500 net income
1947	1,600 loss

You may carry back the $1,400 loss in 1943 to 1941 but you can't go back further than that. Deducting $500 from $1,400 leaves $900 balance, which may be applied to the $1,200 net income you earned in 1942, leaving $300. Now the 1943 loss has been absorbed by the two-year carry-back with $300 of 1942 net income remaining and there is no loss carry-over to 1944 and 1945. But the $1,200 loss in 1944 may be carried back to 1942 to clip that $300 overage, leaving $900 still unabsorbed.

To this point, you have been using the carry-back amendment, now you switch to the carry-over provision legalized in a previous bill. Carry forward the $900 to 1945 and 1946. Deduct the 1945 income of $400 from $900 leaving a loss balance of $500 still to go, which may be deducted from $1,500 net income in 1946, leaving $1,000. In 1947, you lose $1,600, which may be carried back to the $1,000, wiping out 1946 net income and leaving a loss balance of $600, which may be carried over to 1948 and 1949. Before these provisions were legalized, you took such losses on the chin, now you can take credit for them. A contractor with the foregoing set-up of figures would have no net income from 1941 to 1947 and would, over the years, pay no tax thereon. Many taxpayers, from now on, will be able to show profit and loss figures that can be adjusted, more or less, in a similar manner, to effect tax economies.

Another important change in the new tax bill permits you to deduct non-business expenses paid or incurred during the taxable year for the production or collection of income, or for the management, conservation or maintenance of property held for the production of income. Heretofore, the courts have held, that although income from non-business activities was taxable, expenses incurred thereby were not deductible. However, do not confuse this amendment with losses suffered in transactions not entered into for profit. For example, if you bought a pleasure car and sold it at a loss, that is not deductible, or if you lose money on the sale of a residence used for your home at the time of the sale. But, if you make a profit on such a sale, your gain is taxable. The property must have been used for income-producing purposes before and at the time of the sale to get a deduction for loss and that deduction is subject to capital gains and loss limitations.

Depreciation and obsolescence on income-producing property, whether used in business or not, are deductible, in fact, any charge incurred in connec-

[Continued on page 88]

HOW THE CARRY-BACK AND CARRY-OVER PROVISIONS PROVIDE TAX RELIEF.

Losses in 1943 and 1944, which may be carried back to 1941 and 1942	$2,600
But net income in 1941 and 1942 totalled only	1,700
Balance of carry-back not absorbed is carry-over to 1945 and 1946	$900
Profit in 1945, which is deducted from foregoing carry-over loss	400
Leaves a balance for carry-over to 1946	$500
Net income in 1946	1,500
Net income remaining from 1946 after deduction of carry-over	$1,000
Loss in 1947 that may be carried back	1,600
Loss not absorbed, which may be carried over to 1948 and 1949	$600

THE NET OPERATING LOSS *for any taxable year not used or absorbed in the carry-back may be carried forward to the two succeeding years. The carry-back period also covers two years. A loss may not be carried back to a taxable year beginning prior to 1941. This chart is based upon figures given in the text.*

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Current Characteristics Affect Voltage Drop

By Ray W. Ashley
Research Engineer
Electrical Contractors Association of City of Chicago

VOLTAGE drop is a consideration in electrical system design that is far too often passed over lightly. When it is recognized as important, many are prone to use d.c. formulae to determine the drop on a.c. systems. This introduces errors which increase as larger cables and lower power factors are encountered and may lead to serious trouble.

The accompanying chart "Effects of Current Characteristics on Voltage Drop" was designed primarily to show, at a glance, the approximate errors resulting from the use of d.c. formulae to calculate voltage drop for a.c. loads.

Basically it shows:

1. A comparison of voltage drop under direct current and alternating current conditions.

2. Voltage drop as it appears under various power factor conditions.

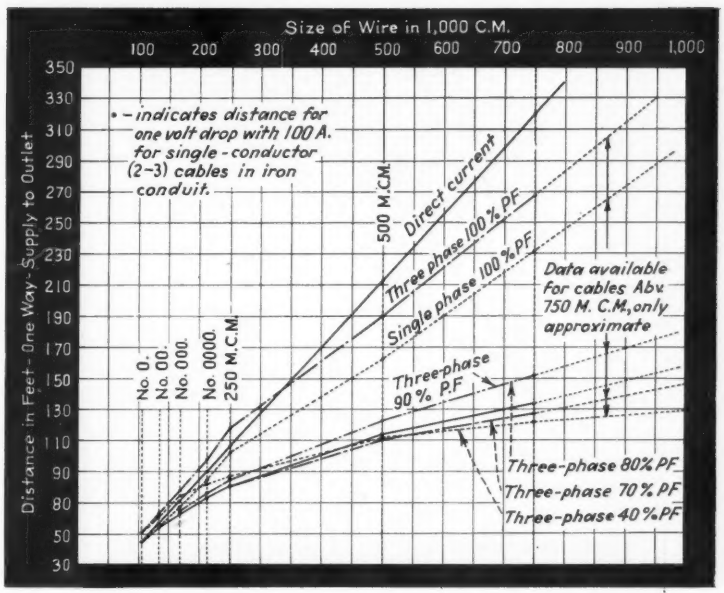
A quick glance at the curves, based on a one volt drop per 100 amperes of current, shows that the maximum length of a circuit decreases as the power factor of the load decreases. When compared with the direct current curve, the errors involved in using d.c. values for a.c. voltage drop become apparent. Taking a few specific examples from the chart, we find the following:

For cables installed in iron conduit:

Cable and Percent Error

Current	*500 MCM*	*750 MCM*
3-phase, 100% P.F.	12%	16%
1-phase, 100% P.F.	31.5%	35%
3-phase, 70% P.F.	89%	184%

The graph shows that the voltage drop for different sizes of cable is affected to a large extent by the power factor of the load. The greatest drop occurs when the angle of impedance of the cable is the same as the power-factor angle of the load. The greatest variation, due to load characteristics, occurs in the larger cables.



A graphic picture of how voltage drop is affected by the type of current and the power factor of wiring systems and its application.

Although not primarily developed to calculate voltage drop, the chart can be used for this purpose. Let's consider a typical example.

Problem: Determine the voltage drop for a 400-ampere, 70 percent P.F. load, served by a 500 MCM circuit, 200 feet (supply to outlet).

Solution: From the chart—for 500 MCM cable, 3-phase, 70 percent P.F., the distance for one volt drop per 100 amperes is 110 feet.

For 400 amperes at 70 percent P.F.:
The distance for 1 volt drop

$$= \frac{100}{400} \times 110 = 27.5 \text{ ft.}$$

Then:
Total Volts Drop

$$= \frac{\text{Total distance}}{\text{Distance for 1 volt drop}} = \frac{200}{275}$$

$$= 7.27 \text{ volts}$$

Reducing the above procedure into a simple formula we have:

$$\text{(1) Volts Drop} = \frac{A}{100} \times \frac{D}{R}$$

Where:
A = Load amperes
D = Total Distance — supply to outlet
R = Chart reading for given size cable and power factor.

Substituting the values of the above problem in this formula (1) we have:

A = 400 amperes
D = 200 feet
R = 110 feet

Then:

$$\text{Volts Drop} = \frac{A}{100} \times \frac{D}{R} = \frac{400}{100} \times \frac{200}{110}$$

= 7.27 volts.

In the past, feeder installations in general have been based on connected load without taking into consideration the diversity factor. As a result no serious difficulties, beyond losses due to excessive voltage drop, have been experienced.

Due to wartime emergency conditions, however, with scarcity of critical materials and round the clock production, the tendency is to base feeder design on the estimated demand. To assure electrical system efficiencies under these circumstances, voltage drop calculations must be as accurate as possible.

Reducing Infra-Red

A Cincinnati motor repair shop conducted a series of experiments to reduce heat-up time on infra-red baking

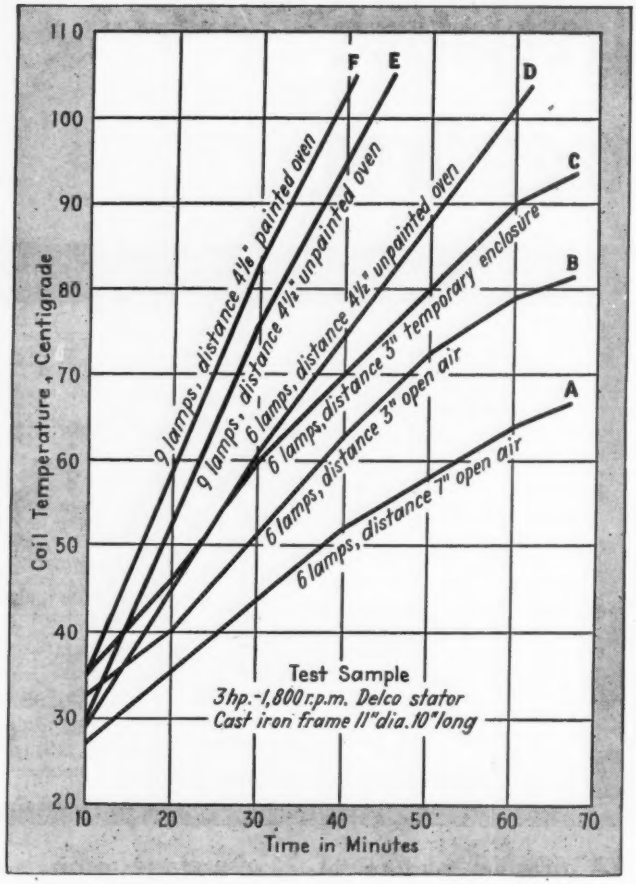


CHART 1 — HEAT TEST *shows how the time required to heat up a piece of work to baking temperatures varies with the type of enclosure, number of infra-red lamps and the distance of the lamps from the work.*

EQUIPMENT heat-up has always been a non-productive item in motor shop bake oven operation. With the advent of infra-red baking technique, this was materially reduced. However, a substantial amount of time still had to be devoted to this function.

When we first used infra-red as a means of baking stator coils, we applied the rays directly on the coils from both sides of the stator. Now we apply the rays to the outside of the stator and allow the heat to soak through to the coils. The quick heat-up in this method (20 to 25 minutes) cannot cause strains in the frame due to expansions which now occur first at the outer surfaces.

Additional revision of technique and experimentation was made to reduce the heat-up period to a minimum, in order to eliminate as much lost time as possible. Six tests were made on a single stator and the results recorded in graph form. Accurate temperature readings were taken by measuring the resistance changes in the coils themselves. The frame temperature was estimated at 8 to 15 degrees C higher than that of the coils during the heat-up. This varies during the process, being maximum at the start and tapering to zero when the baking temperature is reached.

The curves in Chart 1 indicate the shortening of the heat-up time resulting from various changes in the conditions as noted.

Curve	Lamps	Type of enclosure	Distance
A	6	open air	7 -in.
B	6	open air	3 -in.
C	6	temporary	3 -in.
D	6	oven	4½-in.
E	9	oven	4½-in.
F	9	interior	4½-in.

Each successive change indicated a shorter heat-up time and the final test showed that part of the lamps could be switched off at about 75 degrees C coil temperature if a baking temperature of 115 degrees C (240 degrees F) is desired.

The type of oven (see diagram) in which the tests were made is rated as 15-inches—meaning that equipment 15-inches in diameter and smaller can be handled by it. The maximum size stator accommodated is a 5 hp., 1800 rpm. unit. The oven is equipped with nine 250 watt infra-red lamps; four connected to one circuit; five to a second circuit. Each circuit is controlled by a time switch which is set according to the size of the piece to be baked, the time decreasing with the smaller work. When the second circuit cuts out, a signal indicates the bake is completed.

A typical baking operation requires about 110 minutes; 20 minutes for preheating with nine lamps (2250 watts); 15 minutes for complete dipping and varnish penetration; 20 minutes for heat-up with nine lamps; 55 minutes for baking. At roughly two hours per unit, four stators can be baked during an eight hour day with a fifth handled after hours with the aid of the time switches.

This type of oven may never eliminate the gas fired oven in service shops, but every shop should have one or more (of different sizes) to handle rush jobs. It is possible to strip and rewind a small stator in from five to six hours. With a two hour bake, the job can be delivered the same day.

Efficiency tests were made on the three ovens we have in our shop. They are of cylindrical shape with sheet steel sides and asbestos board back and doors. These, indicated on Chart 2, were of the following size:

Oven	Work dia.	Lamp Wattage	Approx. Cost
1	21-inches	2250	$75
2	28-inches	4500	$100
3	15-inches	2250	$50–$60

Efficiency, as arbitrarily used in these calculations, is defined as follows:

From a paper presented at the NISA convention in Cincinnati.

UMI

By F. W. Willey
Willey-Wray Electric Co.
Cincinnati, Ohio

Heat-Up Time

operations to a minimum. The accompanying charts present a graphic picture of the results of the experiments.

$$E = \frac{h_1}{h_2} = \frac{h_3}{h_4}$$

E = efficiency
h_1 = the heat theoretically required to raise work from 50 deg. C. to 100 deg. C.
h_3 = heat equivalent of kwh input to oven during time required to heat work from 50 deg. C. to 100 deg. C.
h_2 = heat actually absorbed by work less the heat radiated by the work.
h_4 = heat radiated toward work plus heat lost through lamp base, etc.

To explain more fully—the uninsulated infra-red oven is outstanding in its ability to heat a piece of work quickly, without the delay of warming up heavy oven insulation and contained air, and the further delay of waiting for convection and air-to-metal heat transfer to begin to function. Since infra-red lamps project heat directly into the work, we are interested in what proportion of the heat produced actually becomes part of the latent heat content of the work piece (i.e., raises its temperature). The efficiency defined above expresses this proportion. However, it must necessarily be taken between the same temperature limits for all tests in order to obtain comparable results, since radiation from the work piece changes widely with changes in the temperature of the work piece. The limits of 50°C and 100°C were chosen for these tests.

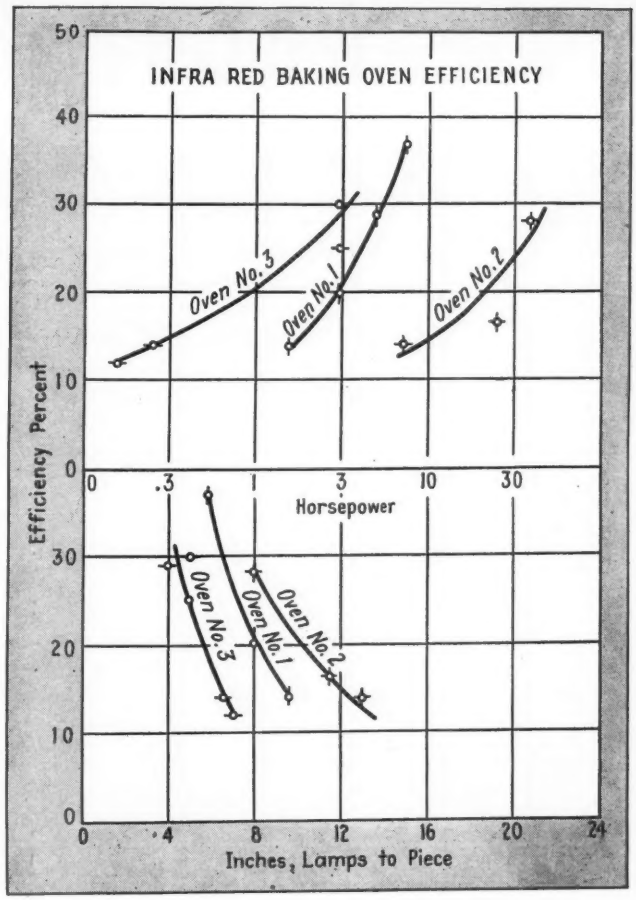
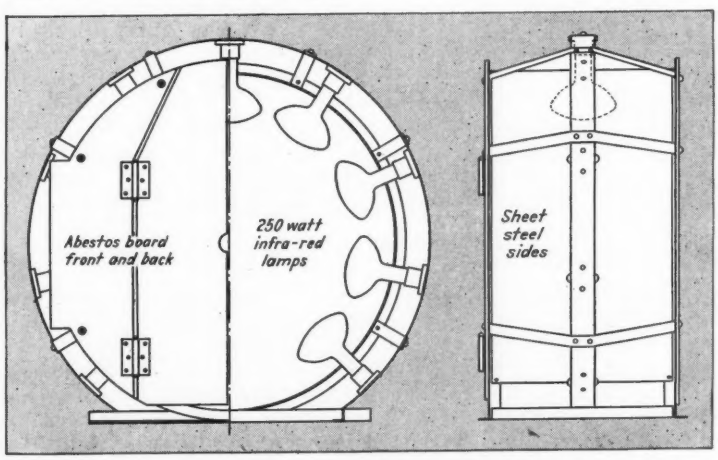


CHART 2 —OVEN EFFICIENCIES *of the units described above as obtained from the tests described and plotted against the horsepower and the distance of the lamps from the work in the oven.*

When the work piece has been raised to baking temperature, the heat input is reduced so as to just maintain this temperature for the recommended minimum time. During the latter period, the calculated "efficiency" will of course equal zero, since no change in temperature of the work piece occurs. Wound motor stators of various sizes and shapes were used in the tests.

Although the ovens used to conduct these experiments were built to accommodate one piece of work, they can be built in tunnel form to handle more than a single stator or piece of equipment. In addition to the low construction cost listed, the fire hazard is low even when placed near a dipping tank. The ovens require no venting, are light in weight, and can be made portable.

This type of baking oven is beyond the experimental stage—having definitely proved its value.



DIAGRAMMATIC SKETCH *of the type of infra-red oven used in the experiments. All are cylindrical in size, made of sheet steel sides with asbestos board front and back. Larger units are on steel stand and can be made portable.*

Accurate CABLE

Wartime needs demand careful conservation of rubber and copper. Here is one method of accurately measuring cable lengths to reduce "leftover" wastage to a minimum.

By Ralph H. Decker, *Consulting Electrical Engineer, Chicago, Ill.*

EVERYONE who has had occasion to estimate, supervise or install electrical systems knows there are several methods of measuring cables that are pulled into conduits and raceways. A very common practice is to measure the straight horizontal and vertical runs and then add "so much" for elbows, offsets, pull boxes and cabinets.

A second method is to "snake" the entire run with a steel fish tape or rope, carefully measure the tape, then resnake the run to pull in the cables. This method requires considerable time and non-productive labor since it represents a duplication of effort.

A third and much more accurate procedure, which might be called the "point of intersection" method, is the subject of the attendant discussion. There is nothing tricky or complicated about it. It is simply a method of measuring from the points of intersection of conduit runs at elbows, offsets and pull boxes, then adding allowances, derived from an empirical formula, for the elbows and offsets. To minimize the calculations necessary to determine these allowances and cable lengths, I have computed a table of values as shown in the accompanying chart. These values are tabulated for 90 degree elbows and 45 degree offsets; for conduit sizes from 1½ inch to 6 inch.

To illustrate the use of the table, let's consider the significance of the values "C" and "L" in formulae (1) to (4). The quantity "C", computed from formulae (1) and (3), is the linear distance from the point of intersection of the straight conduit runs to either end of the elbow. Since each elbow has two ends, a value 2C, shown as a unit quantity in the table, is used in determining cable lengths. To get the actual straight-line measurement of the conduit, this quantity 2C is subtracted, for each elbow or offset, from the total point of intersection measurement. To determine the cable length, the value "L" (length of elbow) for each elbow or offset, plus the length of pull boxes must be added to the actual conduit lengths. The values of "L" are computed for formulae (2) and (4) on the chart.

Let's assume the following values for L1, L2, etc.,. in the example shown under the accompanying table and work out the conduit measurements and the cable lengths. Assume the conduit size as 2½-inch; there are six elbows and one pull box in the complete run.

L1 = 50 ft.	L3 = 5 ft.
L5 = 3 ft.	L7 = 15 ft.
L2 = 10 ft.	L4 = 25 ft.
L6 = 25 ft.	L8 = 100 ft.

Then, from the table — for 2½-inch conduit, 2C = 2.5 ft. and L = 2.25 ft. Substituting in formula (5):

$$\text{Conduit length} = (L1 + L2 + L3 + L4 + L6 + L7 + L8) - (6 \times 2C)$$
$$= (50 + 10 + 5 + 25 + 25 + 15 + 100) - (6 \times 2.5)$$
$$= 230 - 15 = 215$$

Substituting in formula (6):

$$\text{Cable length per leg} = (L1 + L2 + L3 + L4 + L5 + L6 + L7 + L8) - (6 \times 2C) + (6 \times L)$$
$$= (50 + 10 + 5 + 25 + 3 + 25 + 15 + 100) - (6 \times 2.5) + (6 \times 2.25)$$
$$= 233 - 15 + 13.5 = 231.5 \text{ feet per leg.}$$

These formulae may seem long and drawn out but, in reality, they are very simple. Boiled down to plain language they say this: Take the straight line measurements from the points of intersection; subtract the quantity 2C for each elbow and offset in the run; add the quantity "L" for each elbow or offset; add the length of each pull box not at intersections. This will give the correct length of cable per leg. Of course suitable allowances must also be made for extensions and connections in panels and cabinets and the small wastage caused by the preparation of the cable ends for the pulling operation.

Not only is this procedure more accurate than others, but it enables the estimator or supervisor to determine and order the correct cable lengths before the conduits are actually installed—provided they are installed in accordance with the plans and accurate dimensions are given. One of the many outstanding examples of the accuracy of this method occurred in the installation of more than a half million feet of 500,000 CM. cable with a total loss of only 29 feet after all connections were made. This loss was caused by a change in a pull box location and the necessity of having "handling lengths" additional to that usually required. The loss or waste at cable ends was inconsiderable since the pieces were "inches" in length. In contrast with the above, the writer is familiar with a large commercial building installation of the same size cable where, due to an inaccurate method of determining cable lengths, the wastage of cable amounted to a few thousand feet.

Once this method is firmly entrenched in the estimator's or supervisor's mind and is used consistently, substantial savings in waste cable and time can be accomplished. And that is something we are trying to accomplish in these days of national emergency.

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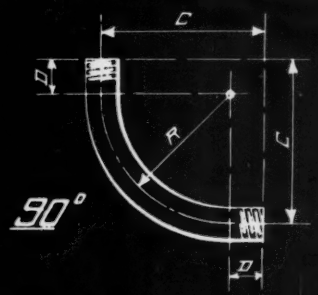
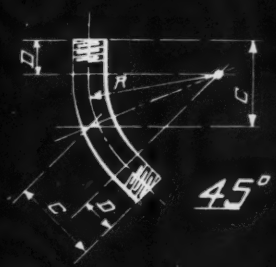
MEASUREMENTS

ESTIMATING DATA

ALLOWANCES TO BE MADE IN CONDUIT AND CABLE RUNS WHEN MEASURING FROM THE POINTS OF INTERSECTION OF RUNS AT ELBOWS AND OFFSETS





(1) $C = R + D$

(2) L - LENGTH OF ELBOW $= \frac{\pi}{2} \times R + 2D$

(3) C - TAN 22° 30′ $\times R + D$

(4) L - LENGTH OF ELBOW $= \frac{\pi}{2} \times R_1 + 2D$

							USE THESE VALUES IN MEASURMENTS			
SIZE	R	D	2C-90°	L-90°	2C-45°	L-45°	2C-90°	L-90°	2C-45°	L-45°
1-1/2	8.25"	2.75"	22.0"	18.458"	12.334"	11.979"	1.75"	1.5"	1.0"	1.0"
2	9.5	4.125	27.25	23.163	16.120	15.706	2.25	2.0	1.25	1.25
2-1/2	10.5	4.187	31.374	26.857	19.072	18.614	2.5	2.25	1.5	1.5
3	13.0	4.75	35.5	29.920	20.269	19.710	3.0	2.5	1.75	1.75
3-1/2	15.0	5.0	40.0	33.462	22.426	21.731	3.25	2.75	1.75	1.75
4	16.0	5.312	42.624	35.757	23.879	23.190	3.5	3.0	2.0	2.0
4-1/2	18.0	5.5	47.0	39.274	25.912	25.137	4.0	3.25	2.25	2.0
5	24.0	5.0	58.0	47.699	29.882	28.850	4.75	4.0	2.5	2.5
6	30.0	6.5	73.0	60.124	37.853	36.562	6.0	5.0	3.25	3.0

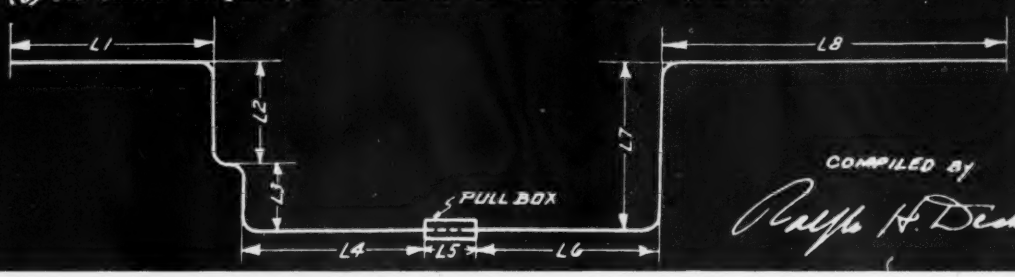
FOR CONDUIT: STRAIGHT LINE MEASURMENT MINUS 2C FOR EACH ELBOW.

FOR CABLE: STRAIGHT LINE MEASURMENT MINUS 2C PLUS L FOR EACH ELBOW

EXAMPLE:

(5) For Conduit: Length = (L1 + L2 + L3 + L4 + L5 + L6 + L7 + L8) - (6 x 2C)

(6) For Cable: Length = (L1 + L2 + L3 + L4 + L5 + L6 + L7 + L8) - (6 x 2C) + (6 x L)



COMPILED BY

Ralph H. Dicken

Editorials

Ease Off The Threat

In our news columns is the text of an OPA interpretation which distinguishes, at last, between the Machinery and Construction maximum price regulations. It helps to settle the conflict between MPR 136 and the new MPR 251. With extreme diligence, advice of counsel, and the careful study of five regulations, General Maximum, MPR 82, MPR 136, MPR 165 and MPR 251, the contractor can now carry on his business with reasonable security from the long arm of the law.

For the purposes of legal consistency it is possible that all these must apply to one business. Maybe, for smooth administration, the several reports to separate pigeonholes must be made. Maybe, for effective control, severe penalties must be ready for those who would violate any letter of the law. But why, in the over-all program, is there no refuge for the overwhelming majority of business men who want to comply, who try to comply, but who can have no assurance that some overlooked phrase or comma will not some day strip them of business and property.

Does this seem tenuous? Are we unduly concerned? Let's hope we are. It would be ridiculous to imply that OPA would use its power to crack down on innocent violators of trivial technicalities. But under the vicious informer clause any shyster with sufficient cunning can build himself a post-war fortune.

Two things can be done immediately. First, the informer clause ought to be eliminated or limited to gross and deliberate violations. Second, compliance with any applicable regulation should limit the legal liability of the contractor to simple re-negotiation to the terms of any amendment or other regulation taking precedence. Neither of these essential reliefs would interfere with the purposes, administration or enforcement of price control.

New Life for Farm Wiring

The recent emphasis on the urgent need for increasing our food supplies in both administrative circles and the Congress is resulting in a more realistic attitude toward farm electrification. Materials in the store rooms of rural coops has been thawed out and its use authorized to extend service to some 120,000 farms.

Unfortunately, the reawakening of farm electrification was accompanied by considerable oratory of the "more abundant life" school. This will arouse political opposition charges of favoritism to the farmer and all the purely political strife that has surrounded REA.

The immediate problem is urgent enough to warrant action by the War Production Board on the facts. It's simple. Farm electrification reduces the labor required to turn out food. We must have more food from fewer farm workers. How much critical material can we allocate for the job?

The oratory, breast beating and revival atmosphere only clouds and complicates the job. Right now we must get electrical farm machinery rolling through whatever agencies we can use.

Priorities for Maintenance

Maintenance has gained a more prominent place than ever in the picture of home front production. Although men, materials and machines may be available, if the machines are not maintained at their peak efficiencies production levels will most certainly decline.

Prudent management has for years promoted good maintenance organization. However poor maintenance is often tolerated when it is a debatable question whether the blame can be laid directly to management or the maintenance department.

For example, a large manufacturing plant in eastern Pennsylvania had followed routine inspection schedules for years and very successfully. Then suddenly when the pressure came on for increased production the foreman on the floor began to refuse inspection time to the maintenance men. After a number of refusals the boys threw up their hands and said "to hell with 'em, when they break down they can come begging." As a consequence inspections were discontinued. But not for long. Several months later the management called the chief electrician and the chief mechanic onto the carpet demanding to know why maintenance costs had gone up all out of proportion to production and why were breakdowns becoming so prevalent and lengthy, causing an actual decline in production. The two men had the answer on the tip of their tongues. They had not reported this situation to the management before since they did not wish to strain relations between the production foreman and their own departments. After hearing the story, the management took the situation into hand. Routine inspections were resumed and the foreman ordered to

NOTICE TO SUBSCRIBERS

Readers of *Electrical Contracting* will observe that the "trim size" of the current issue of the magazine is slightly smaller than that of previous numbers. The reduction in size has been made to enable the publishers to meet an order of the War Production Board limiting the amount of paper that may be used in 1943. Subscribers will note, however, that no change has been made in size of type or in the amount of editorial content per page, but that a substantial saving in paper has been effected merely by trimming the margins.

The publishers have adopted the new size as a war measure and as a contribution to the conservation of manpower and transportation facilities in the production and distribution of paper. Service to the reader has not been sacrificed and will be maintained as far as humanly possible in the face of the problems confronting all of us in our united efforts to win the war.

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make arrangements in their production schedules for whatever time the maintenance department deemed necessary to adequately inspect and maintain all equipment. Soon production was on the upswing and maintenance costs were down to normal.

The criterion of good maintenance is a scheduled routine inspection regardless of the size of the industrial establishment. These inspections reveal defective machinery and equipment which if repaired in time will save not only replacement material but also lengthy shutdowns of critical points in production. Inspection takes but very little time and schedules can usually be drawn up so as to avoid any hindrance to normal production.

Home Maintenance Carries On A-W Theme

Under a strong home maintenance plan, the National Adequate Wiring Bureau is making an effort to keep present wiring systems in order for the duration. Lack of priority ratings for repairing and extending wiring circuits means that this problem will become more acute as available repair supplies dwindle.

The campaign emphasizes the precautions and minor repairs that can be made by the average person. It asks the householder to check on how many circuits he has and where they go. It advises on the problem of overloading and proper fusing. It describes the essential precautions in cord repairs.

The immediate public benefits of such a program are obvious. It also tends to give the home owner some intimate knowledge of his wiring system and its limitations. And out of that will come a post-war interest in better wiring if we are ready to follow through.

Those Fuse Orders

Some confusion has been apparent through the industry as a result of misunderstanding of the War Production Board's regulations on the manufacture and distribution of fuses.

These regulations are intended to provide a control over manufacture and distribution. They are not intended to bar fuses from non-priority use. In fact it is through regulation "up-stream" that the maintenance of an adequate supply of fuses will be assured.

The restrictions applying to electrical fuse manufacturers do not apply to dealers. They may ship fuses for their customers requirements without insisting on priority ratings. According to Linford C. White of the Wholesale and Retail Trade Division of WPB, "Distributors and dealers must not hamper nor restrict the normal flow of fuses. The distributor or dealer cannot set up his own rules and regulations by insisting upon priority ratings where none are legally required."

This is a serious condition that must be corrected immediately. We can't risk electrical fires due to the customers inability to obtain fuses. Fuses are too important to the war effort and civilian requirements. WPB has not and will not limit their sale to all who need them.

Post-War Demand

Some measure of the post-war potential in ready customers is evident in U. S. Chamber of Commerce Study. They say that within six months after the war, 1,500,000 intend to buy refrigerators, 1,200,000 intend to buy washing machines, 900,000 intend to buy vacuum cleaners, 1,200,000 intend to buy radios, 900,000 intend to buy new homes, and so on.

These figures signify the overwhelming interest in things electrical. The potential as the war goes on will probably increase. It is a comfortable business prospect because what takes juice takes wiring. This we know, but the public doesn't and they won't know until we tell them.

Any program to handle this market must concentrate on the wiring needed to make the appliance work. This is fundamental. And in projecting wiring needs we have got to figure on even greater appliance loads than are represented by the conventional items above.

Safety Needs New Emphasis

Casualties in our armed forces since Pearl Harbor have amounted to 61,000 including the missing. Last year over 2,500,000 workers in America sustained injuries ranging from minor lost time accidents to fatalities. These are figures to ponder in our present labor shortage. It is safe to say that most if not all of those accidents were preventable.

Disregarding the humanitarian aspects of the case entirely, though they are more important than any other, this tremendous toll in lost time, in increased costs, in labor turnover and in sheer waste of human resources is a major challenge to management and labor alike. The individual perspective is, however, too limited to force the problem to our attention every day. We don't handle accident statistics. And when one of the boys falls off a ladder or socks a finger with a wrench it's a personal problem about which we have human feelings. And that's just the time when we ought to be abstract and hard boiled.

The business of preventing accidents is more than taking reasonable care. It is a planned campaign of visualizing accidents before they happen and training men to avoid them. It takes posters, lectures, special instructions, conferences and eternal vigilance by one or more men on the job who have the authority to make and enforce safety rules.

Back Talk

Lights Will Go On

To the Editor—"I want to congratulate you on your editorial, When the Lights Go On, as I too, believe at this war's end there is going to be a tremendous opportunity for increasing lighting intensities and any preparation that can be made at this time for the job to be done later, is well worth while. I do feel that all types of records should be kept, particularly those of street accidents, to show the importance of street lighting and any other data along lighting lines that will help in the big job to be done.

"I wonder if you know that a type of Gallup poll was taken in October 1941 in England, the questions involving the greatest inconveniences to the civilian population during wartime. The results were:

1. Depression caused by blackouts
2. Air raid attacks
3. Food worries
4. Men folks away from home
5. Difficulties in shopping, particularly for food products.

"One would have naturally thought that the lack of lighting would have come further down in the scale, but coming first shows its great importance."

Davis M. DeBard, Vice-President
Stone & Webster Service Corp.,
New York, N. Y.

Too many of us, to whom lighting is a business involving pipe and wire and fixtures and profit and overhead, lose sight of the social importance of the proceeds of our various skills. Mr. DeBard's comment above on the poll of British opinion is a challenge. Are we willing to give lighting the same rank?

Methods

BRIEF ARTICLES about practical methods of installing and maintaining electrical wiring and equipment and up-to-date estimating and office practices. Readers are invited to contribute items from their experience to this department. All articles used will be paid for.

SILVER BRAZING

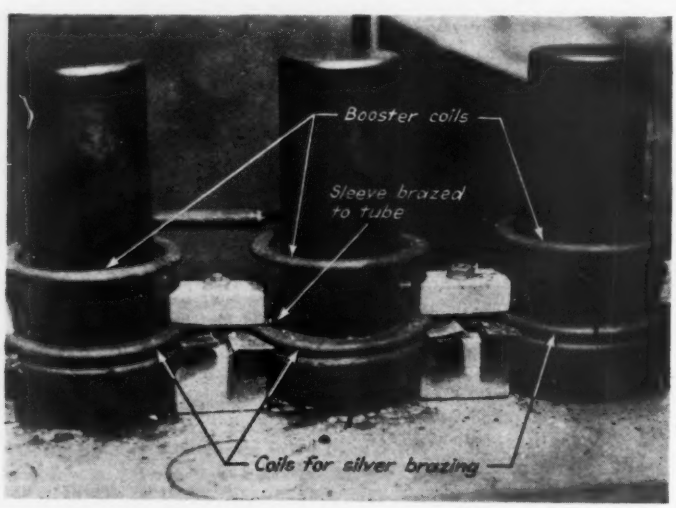
INDUSTRIAL

The application of high frequency currents (200,000 cycles) for silver brazing is a new production aid that is helping this country produce more and more on time.

Three little coils and an electrical "brain box" do most of the work, in a well known Eastern war plant. Brazing is completed in 40 seconds. Two sets of secret parts are in process continuously. When one is being loaded or unloaded the other set is "cooking." An automatic timer in the unit automatically throws a switch every 40 seconds making the cycle continuous as long as the foot pedal is depressed by the operator.

The unit is set so as not to generate more than 1,200 deg. F. which melts the silver solder at 1,180 deg. F. The coils which carry the high frequency currents are continuously water cooled.

In action, the two lower coils get the fast heat. The upper coil is a booster to aid in making the solder fuse faster. This booster coil also evens the heat over the shell of the piece and aids in overcoming air resistance between coil and shell.



***IN THE PROCESS** developed by Lepel High Frequency Labs the coils are continuously water cooled and carry currents at 200,000 cycles, 1,500 milliamps.*

BLACKOUT SWITCH IDENTIFICATION

WIRING

There will be no wholesale hunting for exterior blackout switches on the window and outdoor neon signs of 7-Up retailers in Des Moines, Iowa, when the air raid sirens scream a warning. An attractive and eye-catching placard, mounted behind the switch, provides identification and gives a functional explanation of its existence.

Cooperating with the O.C.D., the Seven-Up Iowa Company, Iowa distributors of this nationally known beverage, have asked their retailers to turn out the neon signs during a blackout. To facilitate this duty of the responsible parties in that area, the company has installed exterior switches in their sign circuits.

To date, approximately twenty such installations have been made in Des Moines, with various Des Moines electrical contractors doing the work.

***NO QUESTION** as to the function of this outdoor light switch on the exterior of a corner tavern. The Seven-Up Iowa Co. advertising department originated this method of identifying blackout switches on their neon lights.*

SELECTION OF MOTORS AND CONTROLS

INDUSTRIAL

There are many ways in which vital materials can be conserved by making our present electrical equipment work just a little harder and by eliminating the somewhat questionable practice of overmotoring. Maintaining a big safety factor at home may materially reduce the safety factor of our service men overseas. Wartime emergencies demand that designs reduce large safety factors as much as is practical.

To aid in this effort to conserve copper and in response to a WPB request, NEMA has issued a set of recommendations on the rating and application of motors and controls. As listed in a recent NISA bulletin to its membership they include:

Size of Electric Motors

1. Accurately determine the horsepower required either by test, calculation or comparison with known power requirements of similar apparatus.

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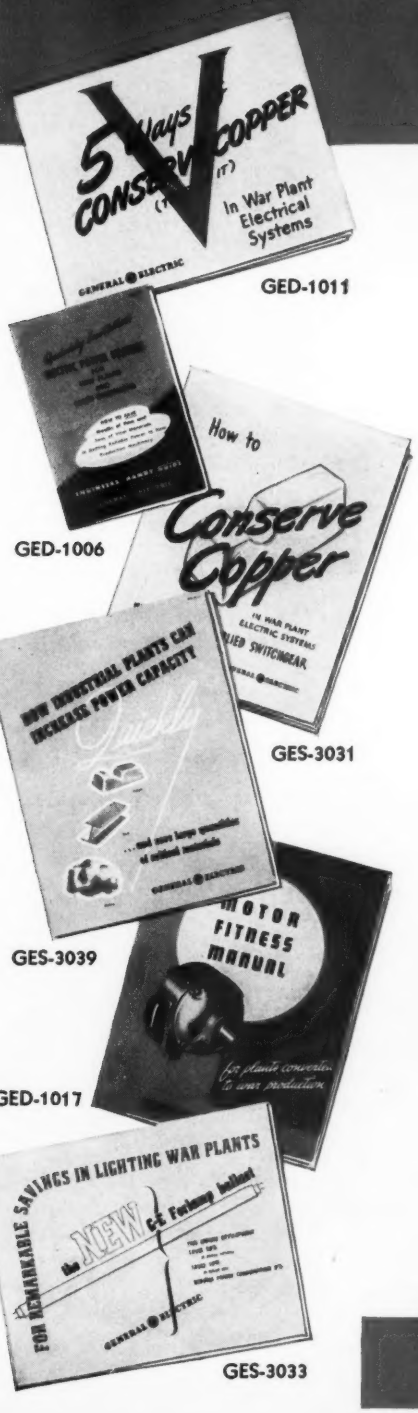
TO ELECTRICAL MEN EVERYWHERE



You Can Save Even More Copper than We Can

In many respects, copper is more valuable than gold. For without it, we, as manufacturers, cannot produce the machines that keep plants humming; without vast amounts of it we cannot produce the electric equipment needed in such large volume by the Army and Navy.

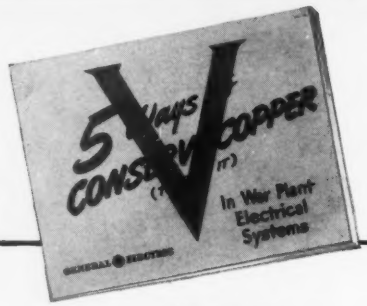
In every G-E plant—in every G-E design office—we are spending thousands of man-hours to the end that not one pound of the "electrical" metal shall be wasted. Our engineers in the field have a similar objective—to help you save copper in the *application* of electric equipment.

For many months we have been making available to everyone the more significant, the most useful facts pertaining to copper conservation. Witness the several publications shown here, and described further in the following pages.

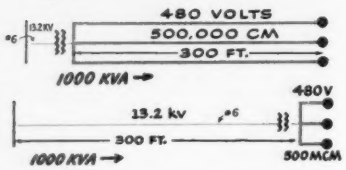
From all these facts, one conclusion stands out clearly. You men in the field—collectively—by making proper application of cable, transformers, motors, control, and other devices, can save even more copper than we can. You can save more in days than a manufacturer can save in months, just by making the right applications. We urge you to study the facts and lend your best judgment to the highly important job of conserving this most precious metal. ***General Electric, Schenectady, N. Y.***

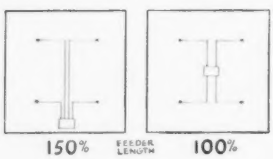
The Army-Navy "E", for Excellence in the manufacture of war equipment, now flies over six G-E plants employing 100,000 men and women.

GENERAL ELECTRIC



FOR NEW PLANTS OR PLANT EXTENSIONS, REMEMBER THESE SIMPLE COPPER-SAVING RULES





To carry 150 kva — 3 phase —

At 208 volts, requires this size copper conductor

At 240 volts, requires this size copper conductor

At 480 volts, requires this size copper conductor

A detailed explanation of these principles is available in our recent publication, "5 Ways to Conserve Copper." Ask for GED-1011.

1. Cover as much distance as possible with high-voltage circuits. Keep the low-voltage (heavy copper) circuits as short as possible.

2. Locate substations in the centers of load areas. Modern safety-enclosed unit substations make this practicable.

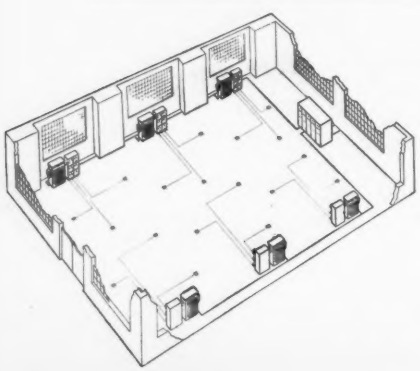
3. Use small-size substations. You save copper that way; but they must not be too small or your use of materials won't be economical. The optimum substation ratings for 480-volt secondaries are 750 and 1000 kva; and for 208/120-volt or 240-volt secondaries, 300 and 500 kva.

4. Distribute power at the highest practical voltage. For example, choose 440 volts for your integral-horsepower-motor circuits in place of 220 volts.

5. Use cable with high-temperature insulation to carry more current—varnished cambric instead of code rubber.

IF YOU SUBSCRIBE TO THESE PRINCIPLES YOU'LL WANT A COPY OF THIS BOOKLET...

GED-1006



One of the important developments in electric power systems since the war began is the load-center method of distributing power in industrial plants. This is based on the use of compact, factory-assembled, load-center unit substations, as shown in the illustration at the left.

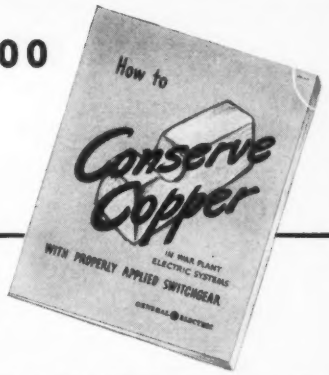
Power is distributed at relatively high voltage (2.4 to 13.2 kv) within the plant to load-center unit substations located near the centers of electrical load areas. There it is stepped down to utilization voltage (below 600 volts) and distributed to the load through drawout air circuit breakers and *short* secondary feeders. By keeping the heavy secondary feeders to the minimum length, considerably less copper is required, and the performance of motors, lamps, etc., is materially improved by the resultant reduction in voltage drop.

GENERAL ELECTRIC

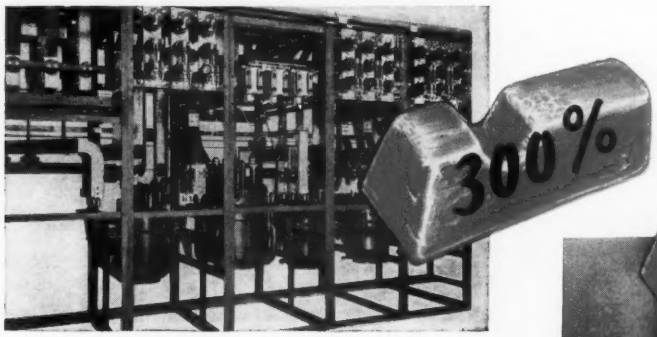
UMI

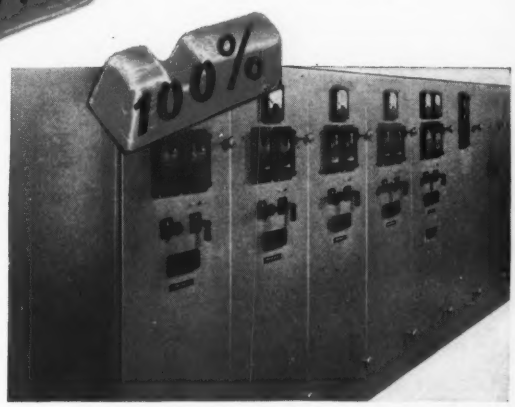
THE RIGHT KIND OF SWITCHGEAR, TOO MEANS *COPPER SAVED*

—AT LEAST 60%, ON MOST JOBS



Write for Bulletin GES-3031, on how to save copper through properly applied switchgear.



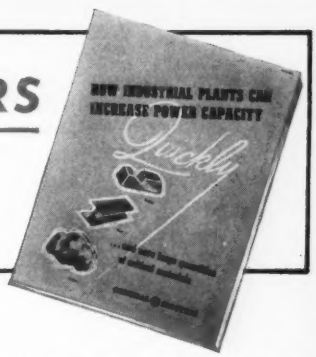


Open-type switchgear—with many strung-out copper interconnections mounted on a bulky, structural-steel framework—calls for a lavish use of copper.

Safety-enclosed switchgear is compact, and its copper interconnections are short. What's more, it completely eliminates the copper disconnecting switches seen in the open-type assembly (above), because modern vertical-lift breakers can be quickly and easily connected and disconnected from the main buses. These and other savings regularly cut switchgear copper requirements to less than *one third*.

CAPACITORS ARE GREAT *COPPER SAVERS*

They provide increased power capacity without adding new generators, transformers, or feeders.



1 INSTALLATION OF FOUR NEW CIRCUITS

	Critical Materials Required (pounds)			
	Copper	Steel	Others	Total
3 New 250-kva single-phase transformers	1525	8100	---	9625
4 New feeder circuit breakers	562	1800	512	2874
Cable for 4 new feeders	4940	---	1230	6170
	7027	9900	1742	18669

2 INSTALLATION OF CAPACITORS

	Critical Materials Required (pounds)			
	Copper	Steel	Others	Total
15 capacitors—90 kva each (One capacitor installed at each load center)	360	2370	2145	4875
SAVINGS IN CRITICAL MATERIALS	6667	7530	-403	13794

Consider a typical industrial plant 400 ft by 750 ft, which has a peak load of 3000 kva, served by 15 circuits, each carrying 200 kva. Because of a large amount of inductive equipment (motors, welders, etc.), the power factor of the circuit is only 75 per cent.

To meet demands for increased production, 718 kva of new power-system capacity must be supplied. You can install four new circuits of 200 kva each. Or you can install capacitors on each of the present circuits. The tables at the left compare the two methods. See how 13,794 pounds of critical materials (6667 lb copper) can be conserved. Incidentally, the capacitor method costs about half as much as the installation of new circuits.

How Industrial Plants Can Increase Power Capacity Quickly—and save large quantities of critical materials—is the subject of a new booklet (GES-3039) now available through your local G-E office.

GENERAL ELECTRIC

UMI

YOU MAY BE ABLE TO SAVE 25% IN *CRITICAL MATERIALS* BY MODIFYING YOUR PEACETIME MOTOR POLICY

The new G-E MOTOR FITNESS MANUAL tells what to do to get the most out of motors, old and new. If you are undertaking new work on motor-equipped machines, if you are "switching" motors from one job to another, or equipping machines with new motors, you'll find this bookful of helpful motor facts will save you valuable time. Included with it is another new publication—"How to Save Critical War Materials." This contains the latest WPB recommendations for the selection of motors, and other useful data. Write today for your "MOTOR FITNESS MANUAL, GED-1017."

MOTORS NEEDLESSLY LARGE FOR THE JOB—plus the oversize distribution circuits they require—may be 25 per cent or more on the side of the enemy! That's the percentage of copper and other scarce materials frequently wasted by overcautious motor specifications—by buying the "next larger size" than a machine actually needs.

The extra amount of critical material used in the oversize motor itself is only part of the loss. Operating a motor continuously below its rated capacity can mean wasted copper all the way back to the power plant. Therefore, even your present motors should be so applied as to avoid "overmotoring," wherever possible.

Why not check with your engineers to see if your peacetime motor policy can be modified in the cause of conservation? You'll be helping to make more metals available where they're needed most to win the war.

This new load calculator—the G-E MOTORULE—makes it easy to select motors that match the job when the recommendations of the machine builder are not available. It helps avoid the risk of undermotoring and the waste of overmotoring. With this motorule, you can check to make sure you are getting the most out of all your machine motors, old or new.

Accurate—easy to understand—applicable to the working of a wide range of materials. FREE with full instructions from your G-E Motor Representative or direct from General Electric, Schenectady, N. Y.

FIND METAL-CUTTING HORSEPOWER *QUICKLY* WITH THE

G-E MOTORULE

NEW DEVELOPMENTS IN FLUORESCENT LIGHTING SAVE BOTH *COPPER AND STEEL*

The new G-E Forlamp (265-volt) ballast for war-plant fluorescent lighting operates four 100-watt lamps—twice as many as any ballast previously available. And it's the same size as the Tulamp 100-watt (118-volt) ballast.

This means a saving of 50 per cent in critical materials in plants where voltages within the 250–280 range are available. Furthermore, large savings of copper can be made in the lighting circuit, too, since this ballast operates on circuits of 277/480Y volts. Single-phase circuits of 277 volts require from 60 to 70 per cent less copper than those of 120 volts. Ask for publication GES-3033.

GENERAL ELECTRIC

Methods

[FROM PAGE 36]

2. For open type, a.c., continuous rated 40° C motors, where motor rated voltage is maintained and ambient temperature is usually substantially below and will only for short periods equal or slightly exceed 40° C, *select the standard hp. rating which is not substantially more than 80 percent of the hp. determined by Recommendation No. 1.*

   Example: The required calculated hp. is 9.3; 80 percent of 9.3 equals 7.44; so select a standard 7.5 hp. motor.

3. For an a.c. or d.c. motor rated on a 50°C or 55°C basis, where motor rated voltage is maintained and ambient temperature is usually substantially below and will only for short periods equal or slightly exceed 40°C, *select the standard hp. rating which is not substantially more than 91 percent of the hp. determined by Recommendation No. 1.*
4. On an open type continuous rated 40°C d.c. motor, where ambient temperature is usually substantially below and will only for short periods equal or slightly exceed 40°C, *select the standard hp. rating which is at least 87 percent of the hp. determined by Recommendation No. 1.*
5. After selecting a motor in accordance with recommendations 2 and 3 above, torque and operating speed should be checked to assure their tendency.

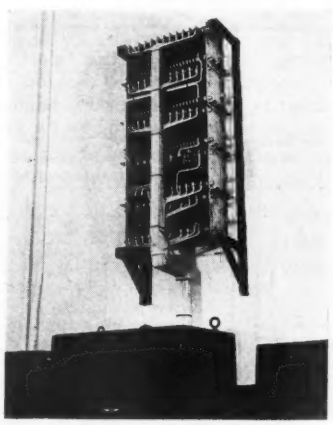
Types of Electric Motors

The type of motor selected shall be of the simplest mechanical and electrical design, which can be used to economically fit the job. Where operating conditions permit, the following specifications should be followed:

1. Open type rather than protected type motors.
2. High speed instead of low speed motors.
3. Single speed rather than multi-speed motors.
4. Single winding rather than two winding, where multi-speed is necessary.
5. A.c. instead of d.c. motors, where alternating current is available.
6. Squirrel cage instead of slip ring motors.
7. Single voltage motors only, should be specified. (Not yet adopted)
8. D.c. adjustable speed motors should have a lesser speed range than formerly used.

Industrial Motor Controllers

1. Controller wiring should follow the shortest possible route consistent with the avoidance of electrical and mechanical interferences.
2. When controllers are built for a specified horsepower, busses, terminals and wiring should be the minimum size required by controller application.
3. Controller capacities should not be in excess of the minimum required for the application.
4. No equipment or device should be specified which can be eliminated without causing severe operating hazards. This includes pilot lights, special nameplates, instruments, test receptacles and jacks, extra terminals, special locks, etc.
5. Control circuit wiring should be held to the minimum size required to carry the current and to insure reliable and safe operation.
6. Special finishes which contain critical materials should not be specified unless they are absolutely necessary to maintain controller operation.
7. Do not specify color coded wiring unless absolutely necessary.
8. Control circuit transformers should not be specified unless the line voltage is over 600 volts; or unless suitable pilot devices of adequate voltage rating are not available.

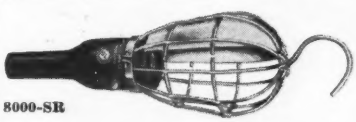


COLUMN OF CABLES is formed by this group of No. 6 asbestos covered solid conductors connecting resistance grid bank with cubicle of 2000 hp. absorption dynamometer at the Buick Aviation Engine Plant. This outstanding example of "tops" in workmanship was done by the Associated Electric Construction Company, joint venture electrical contractors on the job.

Today's production calls for the utmost effort from America's workers. Blackouts — inadequate lighting at point-of-work results in eye strain, physical fatigue and accidents, all of which delay production.

Eliminate shadows, bring your light to the work, by using McGILL Portable, Wood Handle Lamp Guards. Man-power is a valuable asset—use McGILL Portable Guards to conserve it.

Ask your Electrical Wholesaler for the right McGILL Guard for your use, or write us.



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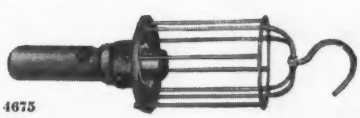

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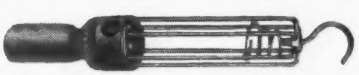


2598

ELECTRICAL DIVISION

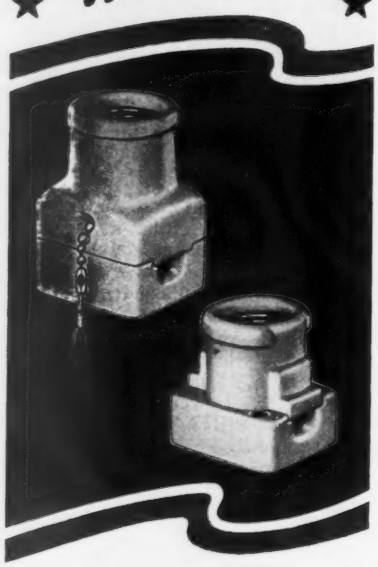
McGILL

MANUFACTURING CO., INC.

VALPARAISO, INDIANA

UMI

P&S
PORCELAIN
WIRING DEVICES
Save Critical Material



Install P&S cablettes for a good wiring job with a minimum of critical materials.

Easy to assemble and install —Designed for today's requirements.

Available for prompt shipment.

ELECTRICAL
Wiring Devices
SINCE 1890
PASS & SEYMOUR
INCORPORATED
SYRACUSE, N.Y.

Methods

[FROM PAGE 41]

9. Control circuit fuses should not be specified if control transformers have less than a 2200 volt primary winding or if the control circuit is direct current.
10. Where full voltage starters are available and, if motor design will permit, reduced voltage starters should not be specified, unless torque must be limited, or if system capacity prohibits full voltage starting.
11. If manual controllers of suitable ratings are available, magnetic controllers should not be used, except where pilot devices are essential to operation or lack of undervoltage protection would endanger human life.
12. Do not specify equipment of higher rating than load requirements in order to secure a safety factor.

General

1. No electric motor or control should be purchased for any use unless reasonable effort has been made to obtain used or second hand equipment; unless the maximum number of shifts are used; or unless reasonable effort has been made to use idle equipment.

REACHING INACCESSIBLE PANELS

WIRING

When the Super Electric Construction Company of Chicago took on the contract to rewire a large office building and change the power and lighting system from direct to alternating current, they encountered the problem of running new feeders through walls to existing flush type distribution panels mounted in brick partitions.

Elbows through the walls to the panels were first considered but later discarded because of probable difficulties in pulling cable. The solution was found in the design and installation of a flush mounted pull box on the corridor wall with an extension trough connecting the pull box and the partition panel. (see Fig. 1.)

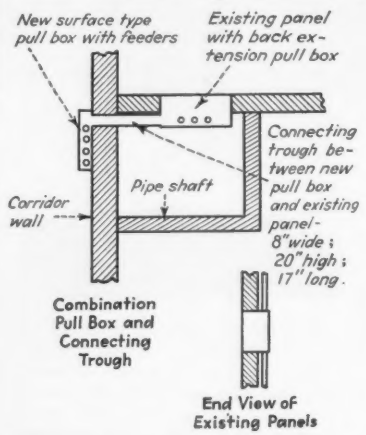

New surface type pull box with feeders
Existing panel with back extension pull box
Connecting trough between new pull box and existing panel- 8" wide; 20" high; 17" long.
Pipe shaft
Corridor wall
Combination Pull Box and Connecting Trough
End View of Existing Panels

FIG. 1. Plan view showing the relative positions of the existing panel, new pull box and the extension wiring trough connecting them.

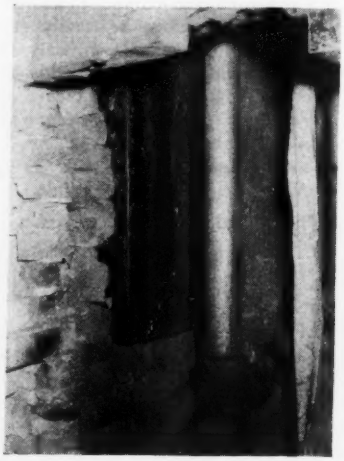


FIG. 2. Access hole is knocked into the corridor wall to expose pipe shaft and back of existing panel. Side of panel was cut out.

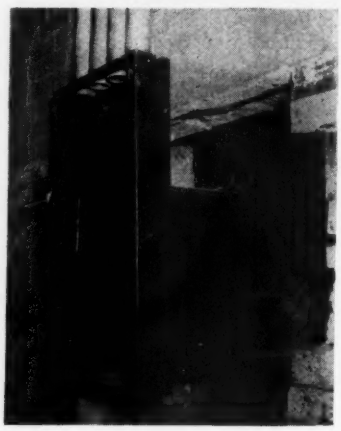


FIG. 3. Mounted pull box, with wiring trough extension aligned with panel, eased cable pulling and provided access to horizontal feeders to other floors.

To gain access to the existing panel, whose pull-box back extended into a pipe shaft, a hole was cut in the corridor wall as shown in Fig. 2. In this particular case a larger opening was made so other trades could get into the shaft. Then the side of the existing panel pull box was cut out to accommodate the extension wiring trough of the

UMI

Dust-tight Panelboards are a MUST *in dust-laden atmospheres*

Guard against explosions that might be set off by exposed arcs. Play safe! Install

(FA) DUST-TIGHT PANELBOARDS

Above: Standard type (FA) Dust-tight Panelboard and cabinet for wall or exposed column mounting. (12" or 15" wide, as required.) At right: Column type (FA) Dust-tight Panelboard and cabinet, with wireduct and pull box. Ideal for 8", 9" or 10" H column mounting.

Underwriters' Laboratories, Inc., have approved them for "Class II, Groups F and G, Hazardous Locations." They are ideal equipment in atmospheres containing carbon black, coal or coke dust, or grain dust. In shell loading plants, coal mines, coal processing plants and grain mills, they are proving a vital protection.

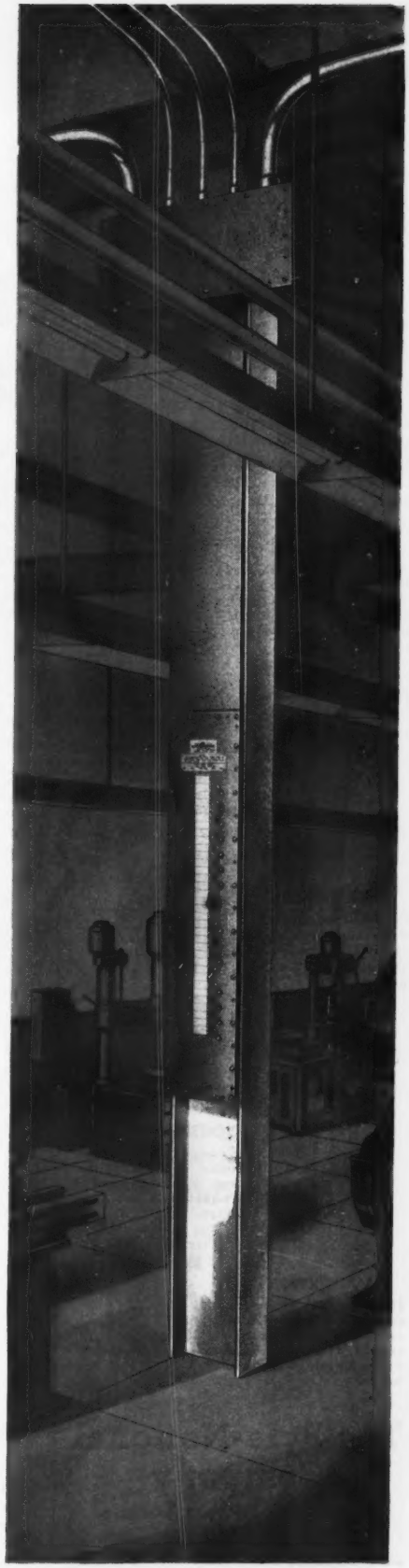
Instead of the usual steel front with door, this panelboard has a solid steel front plate, gasketed all 'round, and secured with screws to the extra wide box flange. It is further rendered dust-tight with welded hubs for conduit outlets, welded box-corners, and handle bushings riveted directly to the steel cover plate. External mounting brackets are provided to maintain the dust-tight construction.

The circuits are externally operable by a mechanism of new (FA) design. The handles operate through dust-tight bushings, and engage the regular handles of the circuit breakers inside the cabinet. ON and OFF positions are indicated on the front of the cabinet.

The (FA) Dust-tight Panelboard may be had in standard type, or in narrow column type. It is of the circuit breaker type, with either the new (FA) Type AC Thermag or (FA) Dublbrak circuit breakers (or other types of lighting branch-circuit circuit breakers) . . . Capacities: 50 amperes or less, for 3 wire, single phase, or 4 wire, 3 phase mains, with lugs only. Available with 4 to 42 circuits . . . Frank Adam Electric Company, St. Louis, Mo.

EST. THE SIGN OF A FA 1891 BETTER JOB
Frank Adam
ELECTRICAL PRODUCTS
for War Industry
FRANK ADAM ELECTRIC CO. ST. LOUIS, MO. U.S.A.

(FA) Electrical Equipment includes: Busduct, Wire and Cable Duct, Service Equipment, Panelboards, Switchboards, Safety Switches, Knife Switches, Floor Boxes, Fan Hanger Outlets, and related equipment.



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Fixture Hanger and Reflector

PYLETS

For dependable lighting installations get the substantial construction of Pylets, plus convenient and labor-saving features that save time on the job. Pylets offer you a range of choice that covers all requirements of industrial plant lighting, including mercury vapor, reflector, fluorescent fixtures, explosion-proof and dust-tight types for hazardous locations. Write for your copy of Pylet Catalog 1100 with complete listings of all types.

ROC SERIES
lighting fixture Pylets for ROC reflectors. Also with mounting flange, ROF Series. Can be furnished with hooks for messenger wire suspension.

AL SERIES
threaded flexible fixture hanger Pylets, allows fixture to swing. Also cushion style which absorbs vibration.

UF SERIES
flexible fixture hanger Pylets, heavy duty sealed type, for protection against dirt, gases, and moisture.

HOOKS and LOOPS
for messenger wire suspension of pendant fixtures. Also suspension hangers and conduit clamps.

VAPORTIGHT
fixtures—all types for surface, outlet box, handrail, wall mounting; single, two and three gang, for lamps 10 to 200 watts.

The Pyle-National Company
1344 North Kostner Avenue
Chicago, Illinois

Methods

[FROM PAGE 42]

new box mounted on the corridor wall.

By employing this method in several locations, Super Electric was able to use the existing conduits in the pipe shafts to feed the old distribution cabinets on the floors above. The use of as many as possible of the existing conduits, cables and cabinets in the building was one of the prime considerations in the rewiring job.

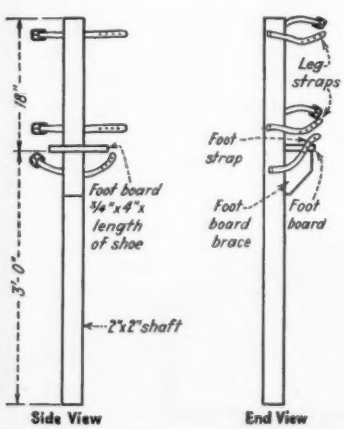
STILTED ELECTRICIANS SPEED WIRING

WIRING

Laziness does pay dividends. It was just such indisposition to exertion on the part of one of the employees, Stan Fisher, of the Electric Construction Co. of Tacoma, Wash., that led to a revolutionary innovation in the electrical wiring field. Stan found climbing up and down a ladder all day long to wire a cantonment really tiring—so he built a pair of stilts just high enough to keep him up among the rafters where he could work with ease.

Genial boss, Charles McPhail, president, is always on the alert for ideas that speed up the work. He saw merit in Fisher's stilts and had more of them made. The result: work on the Camp Adair Cantonment in Oregon forged ahead of schedule.

The stilts are made long enough so the head of the worker just touches the joist. They come to the knee in length. Three straps buckle them solidly to the electrician's legs. This leaves both hands free for eye-level work on the ceiling. One very important feature of these stilts is the foot board nailed to the step of each stilt. This is ¾ inch thick, 4 inches wide and extends the full length of the wearer's shoe. In contrast with the old-time stilt, this gives full support to the foot and aids immeasurably in reducing foot fatigue. With the stilts securely fastened and a half-hour of practice to get back the "boyhood feel", the nine-foot electricians are ready for work.



SIMPLE STILTS boost the wireman up to a convenient working height. Average boost is three feet; more for shorter men. Knee length provides greater agility.

On the first trial the reaction of the men is quite amusing. First they feel silly; then they are frightened and the next impulse is to quit and look for other ground work which is so plentiful these days. Their first few steps are like those of a cat walking on fly paper, but after five minutes they beam a broad grin and think they have mastered the art.

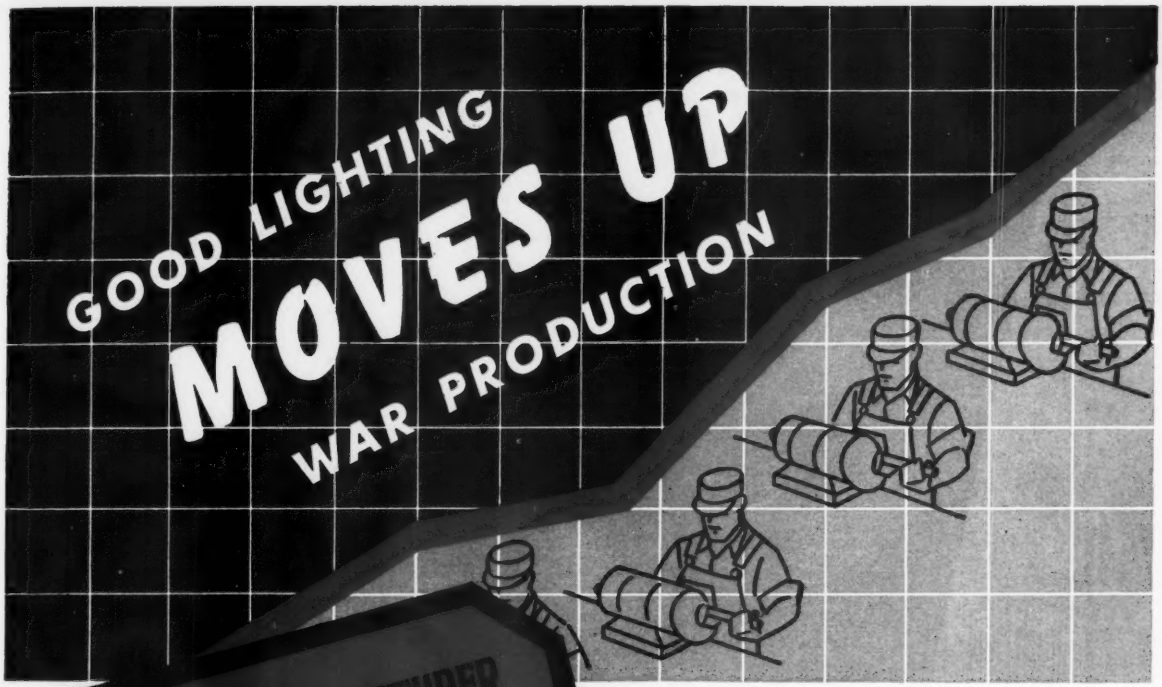
This, however, is the most dangerous stage as the first surge of overconfidence usually sprawls the men on the floor. And what a fall it is! It takes two men to get "stilts" up again and from then on they realize they are not as young as they used to be. But, with a few more turns about the building they acquire their "sea legs" and are ready to go to work. By noon the stilts feel like an integral part of their anatomy.

Our nine-foot electricians work with a new tempo, up and down stairways, through partitions, over lumber piles and other debris. From building to building, loaded with tools and equipment, they carry on with a new speed and confidence.

Wiring with knob and tube or loom-wire, installing receptacles and fixtures, making up boxes, splicing and soldering, all can be done easily and efficiently on stilts. The only requirement is that the material and tools be placed high enough for the "little giants" to pick up while on stilts. Reaching the floor without removing the stilts is an art they have not yet mastered.

Cantonment work lends itself admirably to speed wiring by stilted electricians. The buildings are usually close together and the long mess halls, barracks, post exchanges and post offices provide clear sailing for the men. It's easy to imagine the time saved by just one electrician boring holes with an electric drill and just stepping from joist to joist instead of lugging a ladder and climbing up and down all day.

The use of stilts in commercial work is not entirely new. We are told that they were used in France for various types of work during the last war. Their adoption as a wiring aid has placed the Electric Construction Company's stilted electricians literally "up in the air" on their defense work.



● Because good light helps good eyes do more . . . is even more helpful to older workers . . . efficient lighting has become a vital wartime production tool.

To be sure you give your employees all the *seven** advantages of good lighting enumerated by the War Production Board for workers in War Plants, specify RLM Certified Lighting Units . . . identified by the RLM LABEL.

RLM Certified Lighting Units are built to rigid specifications developed by RLM Standards Institute. Rigid and continuous inspection of Electrical Testing Laboratories assures conformity to RLM Specifications by all manufacturers authorized to supply RLM LABELED Industrial Lighting Units.

For full particulars write any manufacturer of RLM Industrial Lighting Units, or RLM Standards Institute.

Manufacturers of RLM Certified Industrial Lighting Units

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SMOOT HOLMAN COMPANY
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WESTINGHOUSE ELECTRIC AND MFG. CO.
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WHEELER REFLECTOR CO.
Boston, Massachusetts

*"PLANT EFFICIENCY," issued by the War Production Board's Division of Information urges good plant lighting as a practical means for securing: (1) Increased Production; (2) Better Workmanship; (3) Continued Production by Older Employees; (4) Less Eyestrain; (5) Reduction of Accidents; (6) Better Morale; (7) Better Housekeeping.

Guarantee

This RLM certified lighting unit, when properly installed and under normal conditions of use, is guaranteed against mechanical and electrical defects for a period of 90 days from date of delivery to the purchaser. Correction of such defects by repair or replacement of material only shall constitute fulfillment of all obligations under this guarantee by the undersigned manufacturer or distributor.

The Letters RLM Stand for Reflector and Lighting Equipment Manufacturer

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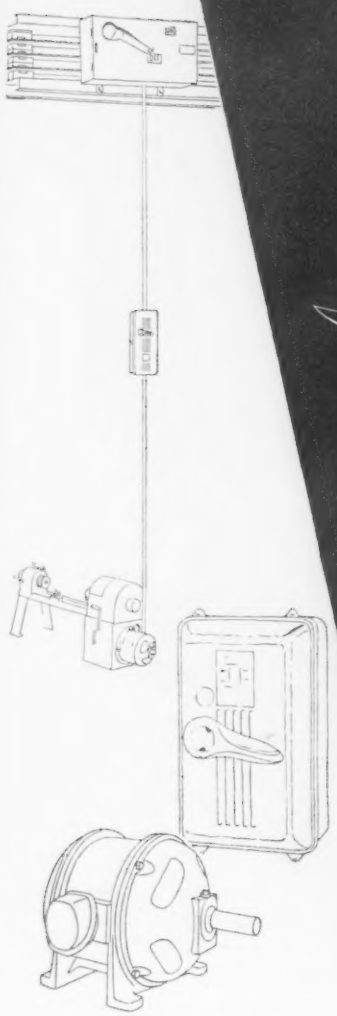
A 100-page Blueprint . . .



Wartime Conservation
RECOMMENDATIONS FOR EFFECTING IMMEDIATE SAVINGS OF CRITICAL MATERIALS IN THE APPLICATION AND USE OF WESTINGHOUSE EQUIPMENT . . . AND AT THE SAME TIME GETTING MORE PRODUCTION OUT OF PRESENT EQUIPMENT
WESTINGHOUSE ELECTRIC & MANUFACTURING CO., EAST PITTSBURGH, PA.

THIS BOOK CONTAINS DEFINITE RECOMMENDATIONS . . .

- **From generator to motor . . .** Critical Material savings in selection, application and use of electrical equipment.
- **On the production line . . .** New methods of speeding production made possible by Westinghouse developments.
- **Keep 'em running!** Maintenance and repair service as an aid to production.
- **Replacement—not substitution . . .** Micarta and Prestite are superior to the Critical Materials which they replace.
- **All in the day's work . . .** How Westinghouse is saving Critical Materials in its own manufacturing operations . . . including complete plans for a systematic industrial scrap salvage campaign.

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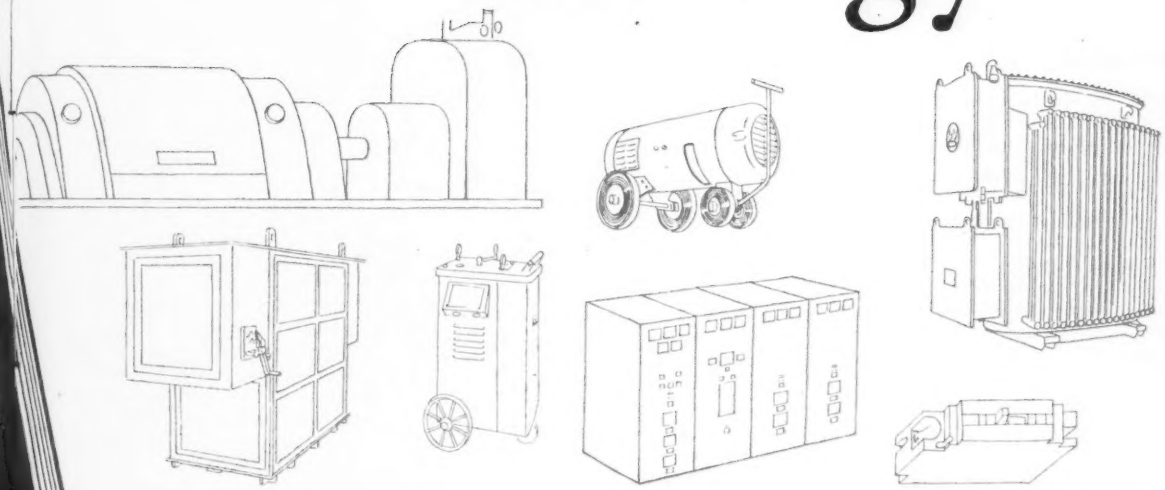
. . . to help you plan your Conservation Strategy

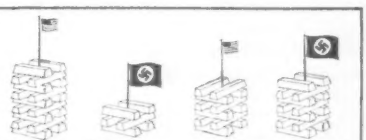


We no longer are "too rich" to worry—the Axis has more Critical Materials than we do.

To help America save Critical Materials . . . to assist industry in planning its conservation strategy, Westinghouse has published an authoritative 100-page book. It contains recommendations for effecting immediate savings of Critical Materials in the selection, application and use of electrical equipment . . . and at the same time getting more production from present equipment.

Write for your copy today (company letterheads, please!). Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., Dept. 7-N. J-90460

Comparison of United Nations and Axis resources prior to war and today



	Before the war		Now	
	United Nations	*Axis*	*U. Nations*	*Axis*
STEEL	73%	27%	50%	50%
COPPER	94%	6%	83%	17%
TIN	99+%	1–%	35%	65%
ALUMINUM	68%	32%	42%	58%
PIG IRON	75%	25%	44%	56%
TUNGSTEN	95%	5%	65%	35%
MAGNESIUM	44%	56%	32%	68%

Westinghouse

PLANTS IN 25 CITIES ... OFFICES EVERYWHERE

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Questions ON THE Code

Answered by
F. N. M. SQUIRES
Chief Inspector New York Board of Fire Underwriters

Neutral Current

Q. *"There has been some discussion concerning the figuring of the size of the neutral wire for a 4-wire system. By 4-wire, I mean 3 phase wires and 1 neutral wire with 208 volts between the phase wires and 120 volts from each phase wire to the neutral.*

Some of us hold that this would be three circuits with a common neutral and that the maximum unbalance would be when one circuit is dead leaving the other two sides with both returning through the common neutral and thus requiring a neutral twice the size of the circuit conductors.

Some of us hold that it being a 3 phase circuit, the load would still be split up and balanced on a 208-120 volt basis with the neutral carrying no current. In this case the neutral need be only the same size as the phase conductors. Section 2204 of the Code, seems to bear this out in that the maximum unbalance should be the computed load. Thus it seems that all four conductors would be the same size. We would very much appreciate an opinion on this."—G.K.V.

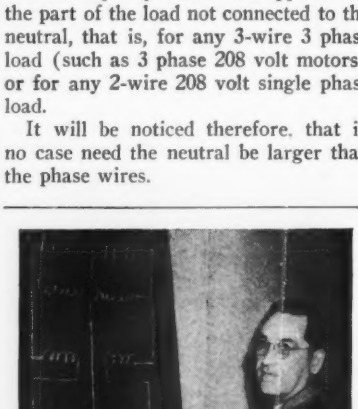
A. The four conductors of a 3 phase 4-wire system feeder supplying only a lighting and small appliance load, should all be of the same size. The current in the neutral of a 3 phase 4-wire Y connected system, sometimes equals, but never exceeds, the current in the phase wires.

The maximum current is carried by the neutral at the time of maximum unbalance, which is when one of the phase wires is not carrying current but the other two phase wires are, or when two phase wires are not carrying current and the other phase wire and the neutral are carrying the current. In these cases, the current in the neutral will not exceed the amount of current in any phase wire, but may equal it. The same holds true on 4-wire 3 phase branch circuits where the individual loads are supplied at 120 volts.

Where a feeder or circuit supplies only 3 phase loads, at 208 volts, or other 208 volt loads, not connected to the neutral, none of the current is carried by the neutral even when the loads in the phase wires are not balanced. In such a feeder or circuit, no neutral wire need be supplied.

Where a feeder supplies both individual single phase 120 volt loads, and loads not connected to the neutral, no neutral capacity need be supplied for the part of the load not connected to the neutral, that is, for any 3-wire 3 phase load (such as 3 phase 208 volt motors) or for any 2-wire 208 volt single phase load.

It will be noticed therefore, that in no case need the neutral be larger than the phase wires.



***BOOSTER TRANSFORMERS** for efficient fluorescent system operation are one of the pet schemes of A. E. Smiley, Kansas City, Mo., electrical contractor. Here, he illustrates the operating principle.*

Electrical Fires

Q. *What electrical cause is the most prolific of electrical fires and what Code rules are there to protect against such fires?—M.C.*

A. A very interesting question, especially in view of the second part!

The National Fire Protection Association, in the October issue of its Quarterly each year, publishes a table of the "Estimated Distribution of U. S. Fire Losses by Causes." For the past few years the number of fires and the losses from electrical causes, have been up at the top of the list. For 1941 out of an estimated total of 674,000 fires from stated known and miscellaneous causes, with a fire loss of $189,000,000, those from electrical causes were numbered at 77,000, with losses of $25,600,000.

Figures published in the News Bulletin of the International Association of Electrical Inspectors covering fire reports in 10 large cities, show that over 38 percent of electrical fires are being caused by motors.

What has the Code done to lower this record? Recognizing the fact that most of the motor fires are automatically started, such as on domestic refrigerators, oil burners, etc., and that most of these burn out even though protected by 15 amp. fuses, which were the smallest fuses formerly required for the protection of these motors, the Code makers put requirements in the Code. Section 4322c, says that such motors would have to be protected either by protective devices rated at not over 140 percent of the rating of the motor or be equipped with inherent overheating devices, which cut off the current when the motors get too hot. The reports of those investigating these motor fires show that very few of the motors so protected are now burning up compared with the motors not so protected.

So the Code has recognized the trouble and has provided corrective measures which are proving effective.

Knockout Blanks

Q. *"We now use 2½-in. and 4-in. duct extensively and in doing so, need a great many knockout blanks to plug up the unused openings in the duct and in the junction boxes.*

"We have purchased the snap-in-blank knock-outs made by the blank Company. It is the opinion of some of our men that they are a hazard to the wires in the duct, while I believe it will not injure any of the wiring.

"Section 3624 of the 1940 Code per-

"WHY I LIKE TRUMBULL magnetics"

3 "REASONS WHY" PARAGRAPHS FROM AN ELECTRICAL ENGINEER'S LETTER

1. **STRAIGHT THRU WIRING**—line and load in same relative positions at top and bottom. No confusion.
2. **FRONT MOUNTING OF PARTS**—contacts always visible—never any question about proper contacting, nor danger to motor because of single phasing.
3. **EASE WITH WHICH CONTACTS CAN BE CHANGED** even by unskilled worker—no manipulations by expert mechanic necessary.
4. **NEVER HAS HAD TROUBLE WITH BURN-OUTS ON MOTORS**—one type he used "burned out five motors."
5. **OVERLOAD RELAYS ARE "HONEST"**—always trip on overload as claimed—he has used heaters whose performance has not been in accordance with calibration.

These five points collectively cover advantages this electrical engineer could obtain in no other magnetic starters.

ADDED FEATURES OF "CM"

REMOVABLE INTERIORS: The entire mechanism is mounted on a steel back plate (aluminized finish) and can be removed as a unit by loosening three non-removable screws—for ease in wiring line and load.

SHOCK ABSORBING ARMATURE MAGNET ASSEMBLY: This shock-absorbing, self-aligning mechanism prevents hammer blows as the starter closes—assures long life, eliminates humming and minimizes coil maintenance.

SOLDERLESS LUGS: Sizes 0 and 1 are equipped with special "wire keepers", grooved on the inside to hold wire rigidly in place. Sizes 2 and 3 have Trumbull solderless "Handi-Lugs."

INTERCHANGEABLE RELAY HEATERS: All relay heaters, ½ to 80 amp., are interchangeable. Automatic reset standard, or hand reset on request.

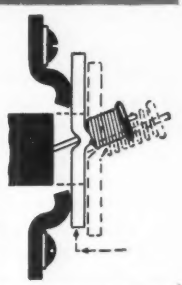
For long life and complete overload protection under severe load conditions specify Trumbull "CM" Magnetic Starters. *Ask for Circular No. 322 and Bulletin No. 404.*

VERTICAL CONTACTS

Pioneered by Trumbull

The Trumbull line of motor starters, both manual and magnetic has long been recognized as a major contribution to the Industry.

One of the best electrical and mechanical devices—Trumbull's vertical, sliding, self-wiping, double-break contact *was introduced by this company in 1927* and has been most effective because it keeps the contact . . .



DUST AND CARBON FREE

at all times. Note the vertical sliding action shown in the accompanying drawing, which wipes the metal *clean* at every operation of closing and opening the circuit. Non-carbonizing glazed porcelain bases also prevent accumulation of both dust and carbon.

AVAILABLE in Sizes 0 ("M"-2), 1 ("CM"-7½), 2 ("CM"-25) and 3 ("CM" - 50).

May be operated by either *remote, local or automatic control.* Also in combination with motor circuit disconnects, contactors and other equipment.

TRUMBULL

MAGNETIC STARTERS

THE TRUMBULL ELECTRIC MANUFACTURING COMPANY • PLAINVILLE, CONN. • A GENERAL ELECTRIC ORGANIZATION

OTHER FACTORIES AT NORWOOD (CINN.) O. — SEATTLE — SAN FRANCISCO — LOS ANGELES

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Here's how every factory can help win this war!

THE old quip about "throwing everything but the kitchen sink" applies with deadly seriousness to this war. To *win* this war, we shall have to throw everything we possess into the fight... every ounce of critical materials that can be spared without crippling the war effort. Yet there are tons upon tons of such materials *immobilized* in our factories—in fact wherever electric motors and motor control are not now used up to 25% above their rated capacity, depending on circumstances. And every *new* motor or unit of motor control not so bought constitutes a new and needless drain upon our stockpiles. For example, every time a 7½ h.p. motor is specified where a 5 h.p. motor would do, 63 lbs. of critical copper and steel are wasted. Every time a 60 h.p. motor is purchased where a 50 h.p. motor would do, 320 lbs. of these precious metals are thrown away.

The War Production Board has urgently requested that wherever circumstances permit, motors and motor control be "loaded" to their utmost safe limits. The entire Electrical Industry has adopted this policy for the duration to save critical materials. Any field engineer of any control or motor manufacturer will be glad to show you how *you* can apply this policy in *your* factory and make a genuine and tremendous contribution to the winning of this war. Call him today... CUTLER-HAMMER, Inc., 1306 St. Paul Avenue, Milwaukee, Wisconsin. *Associate:* Canadian Cutler-Hammer, Ltd., Toronto, Ontario.

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CUTLER·HAMMER
MOTOR CONTROL
C·H

Questions on the Code

[FROM PAGE 48]

mits only 30 wires in any duct raceway, etc. and also the sum of the cross-sectional areas of all the wires at any point in the duct shall not exceed 20 per cent of the interior of the cross-sectional area of the duct, thereby leaving ample room for the above 'snap-in'.

"Will you kindly give me your opinion as to whether it is safe to use this snap-in-knockout?"—A.J.G.

A. The knock-out blanks mentioned by our correspondent are not listed by Underwriters' Laboratories.

In the past, it has often been the practice to close open unused knockouts by means of shingle nail washers or "pennies", and undoubtedly the use of the knock-out blanks, mentioned in the question above, if inserted from the inside of the enclosure would be better than the make-shift shingle nail washers. However, if these knock-out blanks were inserted in the knock-outs from the outside of the enclosure, they would be very apt to interfere with or damage the enclosed conductors.

Underwriters' Laboratories list the "knock-out seals" of two manufacturers in their "List of Inspected Electrical Equipment" under the heading "Outlet Box Bushings and Fittings", so why not use the approved ones?

OFFICIAL INTERPRETATIONS

by the

Electrical Committee of the N.F.P.A.

Interpretation No. 231

STATEMENT: A hoist is controlled by a magnetic reversing switch operated by a pendant push button located in a pilot circuit supplied from one phase of the particular supply by means of an insulating two-winding type transformer.

QUESTION . . . Must the metallic case of the push button station be grounded

(a) when the pilot circuit voltage is 110 volts?

ANSWER . . . Yes.

(b) when the pilot circuit voltage is not over 50 volts?

ANSWER . . . Yes, unless the secondary of the pilot circuit transformer is is grounded.

Interpretation No. 232

QUESTION . . . Will there be a code violation if the grounding conductor is attached to the 2½-inch cold water pipe at any point in its length?

ANSWER . . . No.

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Day-Brite VICTORY SERIES INDUSTRIAL FLUORESCENT FIXTURES

Day-Brite's Exclusive
"ICE-TONG" HANGER CLAMPS
Patented
The DAY-LINE CONTINUOUS provides a flexible method for installing long, unbroken lines of luminaires. Removable non-metallic reflectors.
Patented
Employ "Ice-Tong" principle — weight of fixture holds it in place while single clamp screw is tightened. This shortens installation time on continuous lighting systems.
DAY-BRITE
RLM

WHAT ABOUT NON-METALLIC REFLECTORS

The DAY-LINE UNIT . . . The same construction as the DAY-LINE CONTINUOUS. For chain suspension.

The non-metallic reflectors of these Day-Brite Fluorescent Fixtures have been designed to retain the contour which assures the highest degree of over-all illumination . . . Further, they are finished with a long-life "SUPER-WHITE" baked enamel that is strongly bonded to the reflector surface — is free from grains or "bubbles" — provides permanent high light-reflection values because it is *satin smooth* and easily cleaned . . . Again, the truss-like construction of the fixtures assures maximum rigidity of the completed installation.

Call your Day-Brite Engineering Representative.

DAY-BRITE LIGHTING, INC.
5432 Bulwer Ave. - - - - - St. Louis, Mo.

DayBrite Rivals Daylight — Adds Victory Hours!

Patent Nos. 2,297,869, 133,458
Other Patents Applied For

Day Brite FLUORESCENT FIXTURES

62

The COMPLETE LINE OF FLUORESCENT LIGHTING FIXTURES *Nationally distributed through all leading electrical supply houses*

FLEUR·O·LIERS

..because minutes count in a WAR

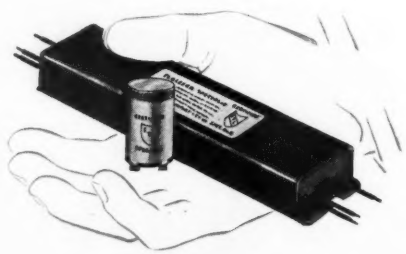
Certified
FLEUR-O-LIER
The Manufacturer guarantees by affixing this label that this Fluorescent Luminaire is a duplicate of samples found by periodic examination to comply with the minimum requirements as set up in the
"SPECIFICATIONS FOR LUMINAIRES, FITTINGS AND AUXILIARIES FOR FLUORESCENT LAMPS"
which are sponsored by the Manufacturers of Mazda Lamps.
ELECTRICAL TESTING LABORATORIES
NEW YORK, N. Y.
E.T.L.
A COPY OF THIS CERTIFICATE SHOULD APPEAR UPON EACH UNIT OR PACKAGE
E.T.L.
FLUORESCENT LIGHTING FIXTURES EMPLOYING EXISTING TYPES OF LAMPS ARE NOT RECOMMENDED FOR SCHOOLS, OFFICES AND SIMILAR LOCATIONS UNLESS LAMPS ARE SHIELDED FROM DIRECT VIEW

LOOK FOR THIS LABEL ON THE FIXTURES YOU BUY

Minutes count in any kind of war work, that's why equipment *must* stand up, whether it's a lathe or a fluorescent lighting fixture. FLEUR-O-LIERS—meeting 50 rigid specifications set up by expert engineers of the MAZDA Lamp Makers—are built to "take it."

Check these vital features

Impartial experts—Electrical Testing Laboratories, Inc., of New York, test and Certify FLEUR-O-LIERS as meeting such important points as high power factor, flicker correction, brightness control, safety, maximum light output, correct heat dissipation and many others. To plant electricians, maintenance men and production executives, that means more than just "lighting."



Certified Ballasts and Starters Guard the User

For example, ballasts and starters, the "control units" of every FLEUR-O-LIER fixture, are also tested and Certified, *for the protection of user and specifier.* That means full

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use of your wiring system, longer lamp life, more light from lamps, *balanced, dependable operation*—saving minutes that count big these days.

Non-ferrous reflectors

Non-ferrous reflectors on FLEUR-O-LIERS are covered by the same rigid specifications as the former steel reflectors, having a high reflection factor, sturdiness, safety, light weight and built to Bureau of Standards design. They are available on suitable WPB priorities.

FLEUR-O-LIERS are made by over 40 leading fixture manufacturers. The FLEUR-O-LIER program is open to any manufacturer who complies with FLEUR-O-LIER standards.

NEW! Famous FLEUR-O-LIER Specifications now in booklet form. Read why FLEUR-O-LIERS are good. Keep the data for ready reference. Write today for booklet and list of manufacturers, to

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FLEUR-O-LIERS

CERTIFIED FIXTURES FOR FLUORESCENT LIGHTING

Participation in the FLEUR-O-LIER MANUFACTURERS' program is open to any manufacturer who complies with FLEUR-O-LIER requirements

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PROOF

OF THE TIME-SAVING QUALITIES OF BURNDY QIKLUGS

TAKE a 4/0 cable, for example, and terminate it the old-fashioned way. Time consumed — *about 20 minutes*, a little more or less depending on the skill of the worker.

Now try a Burndy Qiklug on the same installation and check your time. *About 6 minutes, regardless* of the skill of the worker. There's real time-saving for you. And there's never a need to waste long hours breaking in a new man to do the job.

THEN: ***Waste!*** *Wasted effort, wasted metal, burnt hands, tired workers,* ***wasted time.***

NOW: ***Ease and speed!*** *A few turns of a wrench does the trick, neatly, quickly, securely and efficiently.*

BURNDY

107 EASTERN BLVD., NEW YORK, N. Y.

Questions on the Code

[FROM PAGE 50]

Interpretation No. 233

QUESTION . . . Is the text of section 2551 a fundamental rule?

ANSWER . . . Yes.

QUESTION . . . Will the scope and purpose of the code as to grounding be satisfied if installations conform to sections 2552 and following of Article 250?

ANSWER . . . It is intended that the various provisions of Article 250, except where elsewhere amended, will accomplish the fundamental of section 2551.

Interpretation No. 234

QUESTION . . . Was it the intent to include other control devices such as circuit breakers, knife switches, plug-in units, and so forth, in the limitation of the interim amendment which reads:

"Snap switches rated at 30 amperes or less and employed in panelboards shall have overcurrent protection not in excess of 200 amperes."

ANSWER . . . No.

QUESTION . . . What is the National Electrical Code definition of the term "snap switch"?

ANSWER . . . There is none, but it was the intent in interim amendment No. 59 that the term should be applied to devices controlling branch circuits, the operation of which could not be manually halted when positive motion had once been imparted to the contact-making or closing member.

Interpretation No. 235

QUESTION . . . Is it the intent, when applying section 4402, to require that circuit breakers, if used as disconnecting means, be capable of automatic operation?

ANSWER . . . Yes.

Interpretation No. 236

QUESTION . . . Does the use of a portable hook stick eliminate the question of elevation, as contained in definition of word "accessible"?

QUESTION . . . Does the use of a portable hook stick satisfy the requirements of the definition of the words "readily accessible"?

ANSWER . . . The use of switch hooks was not considered in drafting these definitions.

Interpretation No. 237

QUESTION . . . Does section 1114 require that a device intended to break current shall have ampere capacity sufficient to interrupt current available on the system?

ANSWER . . . No; in many cases it is the load current that determines the ampere or horsepower rating of a device.

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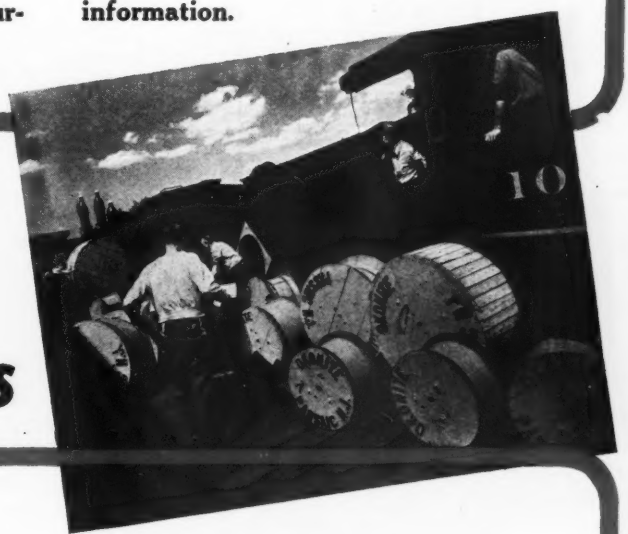
DO:

- order your wire requirements as far in advance as possible, to allow time to apply for material allocations from
- the War Production Board. Consult with government engineers to check with their requirements before purchasing cable for a *governmental financed project.*
- avoid complicated splices and fittings. Your Okonite representative can tell you how to simplify installations.

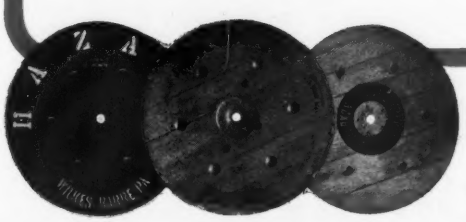
supply us with cutting lengths promptly as we cannot start manufacture, in most cases, until we have this information.

To Expedite Shipment of Wires and Cables



DON'T:

- specify cables that are unnecessarily complicated. Each operation on a cable requires special machines, any one of which may be cause of delay. Keep your cable design simple. Consult your Okonite representative as to how you can do this.
- order short lengths of many sizes. Standardization on a few sizes almost always results in lower cost per foot and much quicker delivery.
- send your order in without specifying End Use, conditions of installation, preference rating, priority authorization, army, navy or other governmental contract number, if any. This information is necessary in order to secure permission to manufacture.



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THE OKONITE COMPANY
THE OKONITE-CALLENDER CABLE CO., Incorporated
HAZARD INSULATED WIRE WORKS DIVISION
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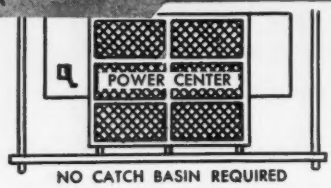
Salvage Your Scrap — Buy U. S. War Bonds



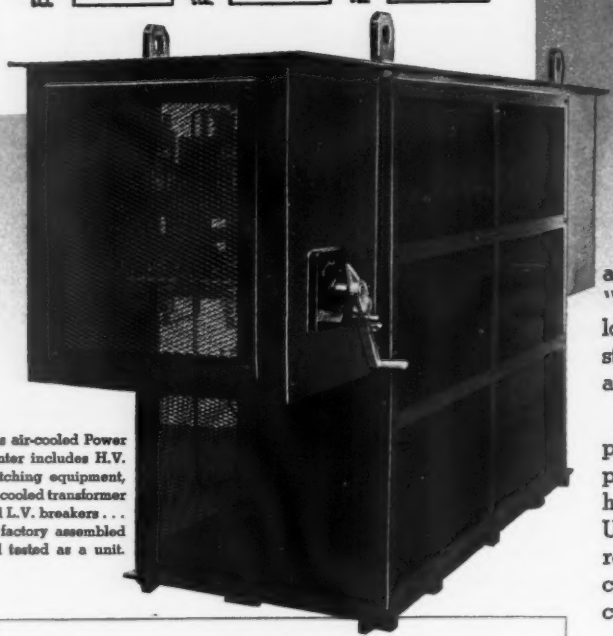
NO CATCH BASIN REQUIRED

Nearer the Load Center to improve voltage regulation

. . . and power anywhere you need it *in a hurry*

with Westinghouse

Power Centers



This air-cooled Power Center includes H.V. switching equipment, air-cooled transformer and L.V. breakers . . . all factory assembled and tested as a unit.

Power centers are available for installation anywhere . . . indoors or outdoors! They are "Packaged Power" to supply concentrated loads. Unit construction saves man-hours in installation and production time because all units are factory assembled and tested.

Westinghouse Power Centers have been applied in all types of Industrial Plants and are proving ideal in office buildings, apartment houses, air bases, Navy Yards, and Army Camps. Used near the load center, they improve voltage regulation and often save more than 75% of the copper otherwise required for long secondary cables.

Power Centers are available with oil, Inerteen, or air-cooled transformers; high-voltage fuses, disconnect switches or selector switches; low-voltage panelboards, breakers or throat-connected, low-voltage switchgear.

Air-Cooled and Inerteen Power Centers can be mounted overhead to save floor space . . . with perfect safety to workmen below.

Ask your Westinghouse representative for complete information, or write Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., Dept. 7-N.

J-70400

FEATURES

- Factory assembled and tested
- Low installation cost
- Less copper
- Better regulation
- Safe
- Attractive
- Minimum space
- No vaults required*

ADDED ADVANTAGES OF AIR-INSULATED POWER CENTERS

- Fire hazard is eliminated. Transformer is completely air-cooled. No cooling or insulating liquids of any kind.
- Explosion hazard is eliminated.
- Toxic gas hazard is eliminated.
- Inspection and maintenance are reduced to a minimum.

**National Electric Code permits air and Inerteen-insulated units to be installed indoors without fireproof vaults.*

Westinghouse

POWER CENTERS

PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

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Industrial Electrification

ENGINEERING · INSTALLATION · MAINTENANCE

PROTECTION

AN endless amount of protection can be provided against the emergency hazards that might arise from the war. In practice, however, under the risks that we may calculate today, the best protection is:

1. Apparatus maintained in the best possible condition that skill and material will allow.
2. Physical protection for the few vital spots where damage could disable major production plans.
3. The thorough training of personnel in emergency repair methods to meet disasters when they come.

The kind of disasters that the enemy might cause are, however, not the only hazards with which we must be prepared to cope. The ordinary industrial accidents, the explosion, the floods, the fires and the storms, take no heed of wartime production schedules. These, too, may be classed as wartime hazards because their effects may be as disastrous as an enemy inspired incident. The ensuing loss of production and drain on resources of critical materials cannot be written off by insurance.

The article beginning on this page describes some of the precautions which may be taken to limit the dangers.

Previous articles covered—

Eliminating Causes of Severe Service Conditions
Providing Adequate Capacity for Increased Demand
Electrifying Operations to Reduce Unit Costs
Safety Protection for Electrical Operations
Increasing Flexibility of Electrical Service
Electrical Aids to Automatic Control
Electrical Ways to Reduce Waste
How to Save Power
Protection Against Sabotage
Improving Working Conditions
Electrifying for Continuous Operation
Electrified Plant Housekeeping
Electrical Problems Under 168 Hour Schedules
Electrical Aids to Plant Conversion
Electrical Aids to Quality Control
Electrical Aids for Green Help
Codes in Wartime
Grounding for Safety
Air Raid Restoration
Operating Replacements
Preparing for Blackouts
Wiring for Quick Changes

Future articles will discuss—

Welding in Industry
Salvaging Electrical Equipment

OPERATING UNDER CONDITIONS OF EMERGENCY HAZARD

TO meet damage that might be caused by war emergency hazards of all types, electrical systems must be designed on a flexible pattern, vital apparatus given special protection and an organization be prepared to cope with situations that could arise.

Emergency damage, which is by no means confined to possible enemy action, would include fire which destroys apparatus, water which weakens insulation, explosions (and penetrating dust) that could wreck plants or equipment, and breakage caused by missiles striking vital spots.

In determining what to protect, the guiding factors would be vulnerability of the location, the importance of the load served and type of equipment, and also available spare equipment.

The first step in restoration of service would be a fast broad survey and report of the damage very much in style of the British practice stated in the October issue of *Electrical Contracting,* followed by procurement of replacement materials and their installation in an orderly manner. The desire to restore service quickly must not lead into that undue haste which makes waste.

Power Supply

The best protection against a failure of one service is, of course, a second service. A second supply is, however, not always economically practicable. Nevertheless, any distribution plant might be so arranged that additional service could readily be tapped in at a number of places, in the event that the service end of the works was to be damaged.

Outdoor substations can be protected against missiles by masonry walls or wooden fences. Sheet metal, sandbags, and ash-filled timber walls have been used. Masonry walls might serve a dual purpose by also acting as fire-stops. Double walls of sheathing filled with ashes are preferred by some because on scattering, their contents would be harmless compared to brickbats. (Transformer operation must be kept in mind

***WHEN EQUIPMENT** needs drying—inside and outside—one of the quickest ways to do it is by use of infra-red heat lamps. Here are armatures passing through a home-made oven. Photo—Fostoria.*

UMI

and ventilation not restricted.)

Damage to high-voltage services involving breakers and transformers generally becomes the concern of the supply company which then takes over their restoration.

Low-voltage services are easy to replace so long as wires and fusible switches are on hand. Service wiring which has been damaged should always be replaced because this part of a system is protected by only the primary fuses.

Switchgear

Switchboards should be protected by isolation from water damage, and from falling objects by the erection of some sort of roof barrier. Metalclad switchgear provides inherent protection against falling and flying fragments.

A brick or concrete room gives good switchgear protection. If practicable, the roof of such a building should not be supported solely by brick walls, which are liable to be blown out and drop the roof slab onto the switchboard.

A wartime short cut suggests itself insofar as instruments are concerned. Many could be cut out of service, perhaps permanently, or returned to the manufacturer for repair.

Open fusible switches on slate or composition bases are readily cleaned, and with a touch of lubrication are ready to resume service. The alignment of switch blades with their clips should be carefully checked.

Many enclosed fusible switches have parts embodying fibre construction, and these must generally be discarded where damaged by water on account of the resulting distortion.

Insulators must usually be cleaned after trouble has cleared, and very careful inspection should be made for insulator cracks, particularly at the clamping rings.

Panel and control wiring must be dried or replaced. Hot air blasts can dry open panel wiring. Coils should be oven dried.

There is one item to replace entirely in all instances of damage and that is fuses. Fuses are the lowest cost, but most valuable item. Protection should never be jeopardized by second-hand fuses.

Circuit Breakers

Many industrial plants have circuit breakers which could no longer adequately interrupt the power which would flow under short circuit conditions as might be brought about by emergency hazards, so the first matter of protection would be to render the breakers non-automatic and use them simply as manually-operated oil switches. Modern high-capacity fuses could be installed ahead of the breakers to provide short-circuit protection.

The work of restoring air circuit breakers involves the removal of silt by fresh water or of dust by compressed air, followed by a thorough drying and cleaning. The lubrication job to follow would need especial care to avoid an overdose of oil which would later on, in combination with dust, turn into gum and would bind the various linkages. Coils would need to be dried and fibre parts which were exposed to water replaced.

Oil circuit breakers would need fresh oil, fibre liners dried out or new ones installed, bushings checked for damage, and also gaskets and wooden lift rods might have to be replaced. A supply of spare contacts would be a real time saver over the effort necessary to redress contacts pitted by heavy arcing.

Transformers

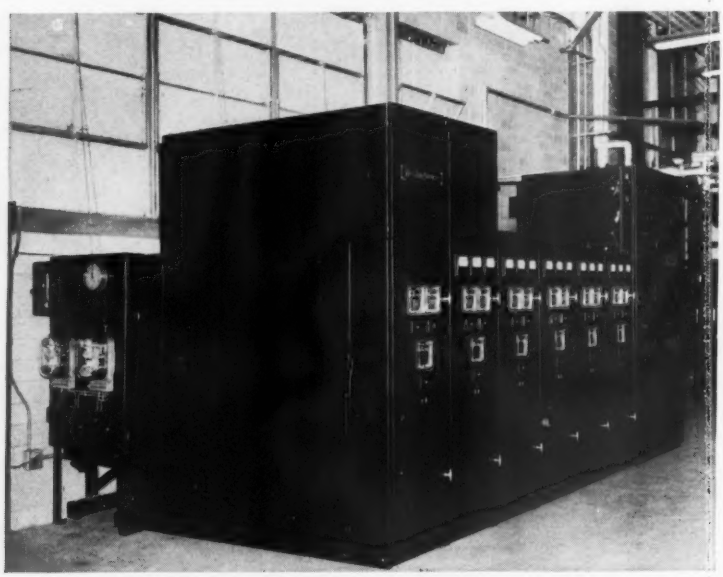
The best transformer protection is that of a thermal unit which creates an alarm when a dangerous temperature is approached. To prevent the serious damage which would result from loss of oil, there is available a device which automatically sets off an alarm on the dropping of oil levels. Such a happening might be an act of sabotage.

Transformers subject to flooding might be mounted on towers.

The greatest damage to transformers in warring countries has come from bombings, causing tank punctures and loss of oil. Instances have been recorded where wooden plugs were used to temporarily plug holes of transformer cases and cooling units, these repairs being covered by an oil-resistant compound.

The first check for damage to transformers, compensators and the like, is to see if there is water or sediment in the tank. An oil spark test should reveal this condition. If not actually wet, short one winding and apply reduced voltage to the other to send approximately one-fourth full-load current through it. To allow moisture to escape, remove the cover, or better still, remove the transformer from its tank. During the drying process, fresh oil could be obtained or the contaminated oil filtered. The temperature should not exceed 85° C.

One of the most effective ways of drying out large transformers is to blow hot air in at the bottom through the oil drain valve, then to a lime box to remove the moisture and through the blower unit again into the transformer.



***METAL-CLAD SWITCHGEAR,** such as this main control board for power distribution to transformer banks in a large aviation plant, provides protection against flying fragments.*

Wiring

Wiring systems can no more than other parts of a plant be completely protected. However, enough sectionalizing facilities should be put in so that bad parts can readily be replaced or cut out of the system. Long feeders should be broken up by cutting in switching points. Feeders should not all be routed through one duct line or manhole. There is a present need for better system planning, because the likelihood of destruction is now greater.

Damage to overhead lines is quickly

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MAINTENANCE GUIDE SHEET

Check Sheet

A Guide to Protection and Restoration of Service Under Emergency Hazards

PERSONNEL

Have employees been given to understand what might be expected of them in the event of damage, and to whom to report?

Do supervisors know what will probably be the extent of their responsibilities and authority in the restoration of service?

Have plans been considered for the welfare of workers operating under emergency conditions with regard to supplies of essential clothing and canteens?

STORES

Have stock piles been distributed to more than one location?

Has the dispersal of stores been so carried out that the stock of any essential item is at more than one location? Should further fire protection be provided for store rooms?

Is there a reasonably adequate supply of basic parts such as wire, switches, fuses, tape and oil?

SERVICE

Do automatic circuit breakers have sufficient interrupting capacity?

Has Utility been contacted as to the point at which an emergency service might be extended?

Should substations be walled in, and switchboard rooms padlocked?

WIRING

Where are the vulnerable bottlenecks, and could they be circumvented?

Are circuits properly fused, and breaker trips in good order?

Should vital exposed cables be fireproofed?

Could wiring be readily sectionalized?

Could feeders be readily interconnected?

Should ground detectors be installed?

LIGHTING

What source could be used to supply temporary lighting?

LIGHTING *(Continued)*

What equipment like portable floodlights might be used right after a plant has been damaged?

MOTORS

Are motors being kept clean to meet more severe operating conditions?

Are loads being checked?

Have nameplate data been recorded and safely filed?

TRANSFORMERS

When was oil last filtered?

Has information on taps, etc. been recorded for possible reconnections?

Could secondaries be safely paralleled?

SWITCHGEAR

Have important switches been rendered inaccessible to unauthorized persons?

In the event of starter damage, is it now known which large motors could safely be started across-the-line?

Are important switches exposed to splinter damage?

GENERAL

What plans have been thought of and equipment considered for the drying of water-soaked apparatus?

The insulation resistance of a clean dry machine at approximately 75 C. should be about

$$\text{Megohms} = \frac{\text{rated voltage}}{\left(\frac{\text{rated kva}}{100} + 1000\right)}$$

Are valuable instruments like meggers and voltmeters on hand?

Would there be a supply of thermometers for use in the drying-out of apparatus?

How could a d.c. supply be obtained for insulation resistance testing?

Should special protection be provided for expensive equipment such as x-ray machines?

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overcome. The most serious interruptions have been caused by underground wiring. This takes longer to replace than overhead lines. Blasts result in cable joints tearing apart two and three sections away. Earth-buried cables stand up better to actual bombing, because they do not stretch as readily as cables in duct lines. Cable risers to switchgear and at terminal poles are especially vulnerable to splinter damage.

Interior wiring of open construction stands up well under water damage, but is usually blown away by blasts. Its advantage is that it can be replaced with a minimum amount of material.

Surface cable wiring has no resistance to water damage and after submersion has generally to be scrapped. Blasts may twist cables, but not wreck them, depending upon size, mounting and so forth. Cables are most useful when it comes to speedy wiring restoration.

To protect conduit and similar raceway systems against war damage, attention should be paid to the couplings and connections, which if neglected become weaknesses. Conduit provides some measure of protection against flying debris.

After damage, wiring should be tested for continuity and for resistance between conductors and to ground. Blasts cause open circuits.

Insulation resistance values vary with lengths of conductors, etc., but generally speaking these values are accepted: One megohm between conductors and to ground for 0—600 volt systems, and one megohm per 1000 volts for higher-voltage installations. The National Electrical Code (Section 3018) has insulation standards for wiring systems ranging from one megohm for small branches to 5000 ohms for the largest complete installations.

Restoration after water damage from floods or other causes, involves draining of conduits by opening of joints, then driving out of water and sediment with compressed air. Another way is to swab the conduit and dry it out by blowing in heated air. Conductors may be withdrawn if these will not be further damaged by handling. Control cables, if wet, may need to be reeled up and dried in an oven. Incidental to cable replacement, it would be well to keep in mind the now permissible use of weatherproof braided wires as grounded neutral conductors for a.c. systems.

Rewiring should be avoided until a building has been dried out because condensation can be very harmful to new work. Service restoration does not imply temporary wiring, which is seldom replaced and which thereafter endangers life, property and production.

Portable floodlighting units can be lifesavers when restoring service. In most cases of damage, lighting units being fragile are demolished or blown away and must be completely replaced. And light must be provided before other repairs can be tackled. It would be one of the first needs.

Motors can be best protected against damage by the simple everyday good housekeeping of keeping them clean, properly lubricated, and protected both electrically and mechanically.

Current figures show that motors are the cause of about 35 percent of electrical fires, and much of this loss is traceable to the misapplication and abuse of thermal protective units. So it follows that a check-up on the thermal units should be the place to start in providing motor protection.

To further the full economical safe

***QUICK PROTECTION** — a centrally located dust-tight emergency switch is used to trip out important motors, and other devices in case of trouble.*

use of motors during wartime, manufacturers have recommended that motors be selected on the basis of 80 percent of measured load, that is, if a machine tool under test draws a peak load of 12 hp., then apply a motor rated at 12 times 0.8 or 9.6, which could safely be met by a 10 hp. motor. This applies to open type 40° C. a.c. motors operated in an ambient substantially below 40° C. For 50° C. and d.c. machines, the multiplier recommended is 91 percent. To meet this change, Interim Amendment No. 72 has been issued to National Electrical Code Section 4322 to allow of the use of thermal protective units rated at 135 percent rated current of 40° C. motors, instead of 125 percent as heretofore. Broadly speaking, motors should be loaded up to 125 percent of normal rating for the duration.

Motors are now running about four times longer than in peacetime, so damage will result unless maintenance keeps pace with use. Dust should be removed from motors to keep them cool and prevent oil contamination. Excess oil catches dust, so it should be wiped off. Moisture mixes with dirt and attacks insulation, so keep them dry. Excess lubrication damages insulation.

Motors damaged by water should be given the general treatment applicable to practically all apparatus using fibrous (Class A) insulation, of namely washing, drying and varnishing. Fibre or wooden wedges may need to be replaced.

Insulation Tests

Resistance tests of windings afford one of the most convenient means of protection against insulation failures. Readings charted over regular intervals can show up incipient failures, the indication of approaching trouble being a continuous steep drop. Resistance, and high potential tests, should be taken at the operating temperature of a machine. When to take a machine out of service depends upon many local factors, but most folks are satisfied to operate ordinary industrial equipment down to one megohm.

Where d.c. is available, a series reading of a voltmeter and the insulation to ground gives the insulation value using this formula:

$$R = R_1\left(\frac{E - V}{V}\right)$$

where R = insulation resistance in ohms
R_1 = resistance of voltmeter in ohms
E = d.c. volts
V = voltmeter reading

Insulation tests should proceed and follow high-potential tests to make sure that insulation is strong enough for voltage test and not subsequently damaged by it. In this respect, the voltmeter method is safer than a 500- or 1000-volt megger test.

The high potential test for new machines should be twice rated voltage + 1000 for one minute. For old machines, 150 percent of rated voltage is considered sufficient.

Insulating oil enters any picture of protection against war damage. By keeping oil in proper condition through filtering, the heating of apparatus can be reduced, which in turn should lengthen the useful life of apparatus or allow for its carrying of a heavier load.

Where the spreading of burning oil could be disastrous, curbs should be built around transformers, regulators and other oil-filled equipment.

May we be spared bombing; but other destruction can occur. Protection against damage should be thought over so that discipline may be established to cope with various emergencies, and to expedite the restoration of production.

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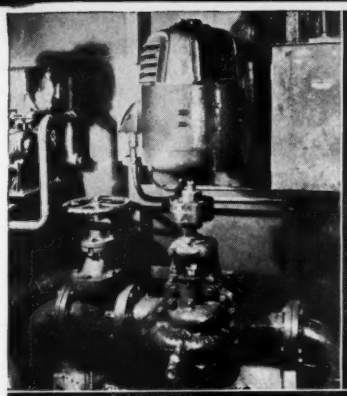
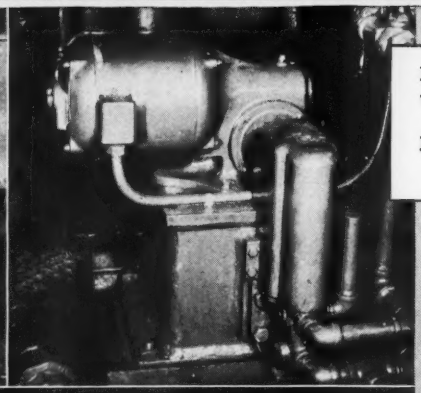
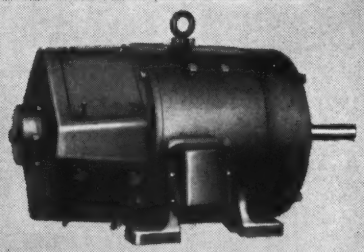




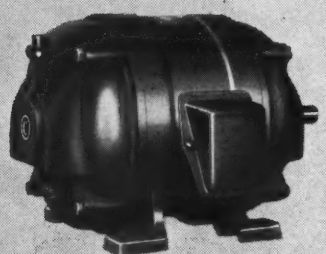
Extreme Left—Century 7½ horsepower, vertical mounted, direct current, drip proof water pump motor.
Left — Century ½ horsepower motor driving a Diesel oil pump.

CENTURY MOTORS and GENERATORS

For the Toughest Sea-Going Service Meet the Rigid War Requirements of Naval and Merchant Marine Applications



7½ horsepower, direct current, ball bearing, fabricated steel, water proof Navy motor.



Century 2 horsepower squirrel cage fabricated steel motor with cast steel end brackets.

Century shipboard motors and generators are built to stand up under

- The toughest sea-going service
- The shocks of gunfire and bombing
- The rigorous climatic conditions of the seven seas

They meet Navy Specifications 17M10 and 17M17, A.I.E.E., recommended practice on shipboard No. 45, and the Maritime Rules of Shipping.

Century Motors' famous ability to "keep a-running" is daily being demonstrated and thoroughly proven on the high seas in applications such as those mentioned above.

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Your nearest Century Application and Service Engineer will gladly tell you all the advantages of Century Motors for *any* job.

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Among the many Naval and other marine applications of Century Motors that have been made and are being made today are the following:

Diesel fuel pump motors
Bilge pump motors
Transfer pump motors
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Fire pump motors
Capstain motors
Hoisting machinery motors
Pumps for fresh water stills
Air compressor motors
Refrigeration compressor motors
Steering gear motors
Fan and blower motors
Oil burner motors
Generators and motor generating sets for light, power, and communication
Workshop machinery motors

308

One of the Largest Exclusive Motor and Generator Manufacturers in the World.

SUMMARY
WAR PRODUCTION BOARD
LIMITATION ORDER L-225

PRODUCT	PRODUCTION QUOTA BASED ON MANUFACTURER'S 1941 PRODUCTION	INSTALLATION RESTRICTIONS APPLYING TO ALL "ELECTRICIANS" *
Rigid Electrical Conduit (Heavy Wall) Sizes ¼" to 2"	40%	May be installed only in Class I, II, III and IV hazardous locations as defined in 1940 National Electrical Code.
Rigid Electrical Conduit (Heavy Wall) Sizes 2½" to 6"	40%	May be installed only: (a) In Class I, II, III and IV hazardous locations; or (b) To protect wires and cables from mechanical injury; or (c) In damp or wet locations as defined in Article 100 of the National Electrical Code.
Electrical Metallic Tubing (Thin Wall) Sizes ⅜" to 2"	No Quota Established	May be installed only to protect wires and cables: (a) From mechanical injury in the wiring to machinery or production equipment; or (b) Embedded in concrete or masonry walls; or (c) In elevator hoistways; or (d) In damp or wet locations as defined in Article 100 of the National Electrical Code.
Flexible Metal Conduit Sizes 5/16" to 3"	No Quota Established	May be installed only to protect wires and cables for necessary flexible extensions less than 12 feet in length.
All other metal raceways and wiring enclosures	50%	None.

This order does not affect used conduits or conduits in the possession of any "electrician" on December 16, 1942.

* *This order applies to any person who installs, maintains or repairs electrical systems.*

PRIORITY RATING—required to purchase or install—A-1-j

THIS IS A SHORT FORM. FOR INTERPRETATION AND DEFINITIONS, CONSULT THE COMPLETE ORDER.

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ELECTRUNITE **Steeltubes**
Reg. U. S. Pat. Off.

ELECTRICAL METALLIC TUBING MARKED WITH A CONTINUOUS FOOT-RULE!

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Here's the Answer to L-225

Use ELECTRUNITE STEELTUBES E. M. T. where it is vital to protect electrical circuits with a rigid steel raceway

There are many good reasons why you should use Republic ELECTRUNITE STEELTUBES wherever permissible.

It is lighter in weight and easy to handle. It is easy to cut, bend, install and wire. It affords the advantages illustrated at the right of this page.

And the cost of ELECTRUNITE STEELTUBES, with necessary fittings, is usually lower than that of threaded conduit. Furthermore, your use of this easy-to-install raceway provides the protection of steel for wiring—yet, in comparison with threaded conduit, *it saves steel for fighting tools*—enough in 100,000 feet of ¾-inch size to build a 30-ton tank.

Your ELECTRUNITE STEELTUBES Distributor is ready to give you further information on Limitation Order L-225, to tell you more about ELECTRUNITE STEELTUBES and its exclusive features, and to help you line up needed electrical supplies so that your jobs move along on schedule. See him at your first opportunity.

1 6-FEET 2 3 4 5 6
"Inch-Marking"—an exclusive feature—gives you tubing accurately measured and marked in feet and inches on ½", ¾" and 1" sizes.
ELECTRUNITE STEELTUBES
The patented knurled inside surface rolled into the steel (Patent No. 1,962,876) makes wire pulling as much as 30% easier. This feature provided on ½", ¾" and 1" sizes.
Compression-type fittings save thread cutting—speed assembly work—end difficulties of running threaded lines in tight spaces.
The ELECTRUNITE bender and bending instruction tag combine with "inch-marking" to form the STEELTUBES bending system that makes bending easier and more accurate than ever before.

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Reader's QUIZ

QUESTIONS from readers on problems of industrial equipment, installation, maintenance and repair. Answered by electrical maintenance engineers and industrial electrical contractors out of their experience. For every question and every answer published, we pay $5.00.

HOOK-UP AND VOLTAGE FOR OVERHEAD CRANE

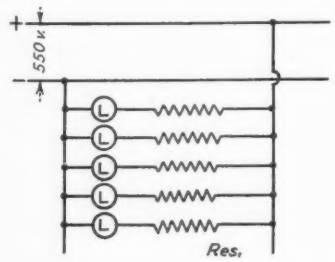
QUESTION 82. Our plant is fitted throughout on 550 volt d.c. for overhead crane service. In this present emergency we are running three eight hour shifts and have had to provide lighting on the cranes. We used a series hookup of five lights. This proved to be an unfavorable and costly system to maintain because of the difficulty of locating burned out bulbs. I wonder if some other reader has had the same experience and what was done to eliminate it? What would be the proper hookup for a parallel circuit and how is the voltage controlled?—D.J.S.

A. TO QUESTION 82. The overhead cranes in our plant operate on 250 volt, d.c. We have four lights on each crane—two on each side of the bridge, staggered slightly, for better distribution of light. On some cranes we use 250 volt lamps; 300 watt on low bay cranes and 500 watt on the higher cranes. On the majority of the cranes, however, we use 125 volt lamps; two in series on each side of bridge.

In the case in question, I suggest the use of two 250 volt lamps in series on each side, with a suitable permanent resistance in each circuit to compensate for the difference between 500 and 550. In the case of 500 watt lamps, 25 to 30 ohms is correct, while with 300 watt lamps, 42 to 50 ohms will be satisfactory.

I don't believe you will have any difficulty locating the bad lamp with this arrangement, and even when a lamp burns out you will still have light on one side of the bridge.—J.W.B.

A. TO QUESTION 82. I had the same experience with series circuits on mine locomotives. I eliminated the trouble by using a resistance in series with each light. In this case I used a resistance made for a line voltage of 220–300 volts and in series with 56 watt 115 volt bulbs. You can correct your trouble by using resistances made



for 500–600 volts and in series with the following size of bulbs 56 watt 115 volt, 94 watt 115 volt, 150 watt 15 volt. The size of resistance will vary with the size of bulb used. The sketch shows a hookup for a parallel circuit and the voltage is controlled through the use of a fixed resistance.—G.B.

A. TO QUESTION 82. Lamps in parallel with resistance control of voltage is not a practical arrangement. The following suggestions are offered: (a) Use clear lamps and determine a defective lamp by inspection of the filaments. (b) Wire a receptacle in parallel with lamps difficult to inspect, locating the receptacle where it is convenient to reach. The burnt out lamp can be determined by using a test lamp of equal wattage and voltage at the receptacle. (c) Increase the number of lamps to 20 in series and use cutout lamps. With this arrangement, the remaining lamps in the series continue to burn when a lamp burns out. The burnt out lamps should be renewed as soon as possible to prevent overloading the remaining lamps in the series.

REVERSAL OF POLARITY

QUESTION 83. We have an electric driven welding machine and a few months ago while the operator was reducing his current the locknut on the adjustment lever became loose and fell off. The operator not noticing it turned the lever too far down thus causing one of the main brushes to short out against a small exciter brush. There was a flash, and immediately the generator's polarity reversed itself. The positive terminal then became negative and remained in this condition until the same accident was repeated after which the polarity again reversed thereby righting itself. What caused this polarity change? —E.B.

A. TO QUESTION 83. The reversal of polarity on this welder was caused by a short circuit of the generator, which occurred when the two brushes touched together. The residual magnetism in the field became reversed, and as a result the generator built up in the opposite direction.—L.H.

A. TO QUESTION 83. This polarity change was caused by a flashback. The field circuit was momentarily opened and this caused the field poles to reverse their residual magnetism or a very heavy surge in the series field circuit would momentarily kill the shunt field and reverse the field pole.—W.L.C.

CIRCUIT HOOK-UP TO PILOT LIGHT

QUESTION 84. On one of our motors equipped with a conventional across-the-line magnetic starter, I would like to extend a circuit to a pilot light which will light when the starter trips due to an overload. Can one of your readers suggest a circuit hook-up which will do this?—R.P.

A. TO QUESTION 84. Below is a schematic diagram of the control circuit of an across-the-line mag-

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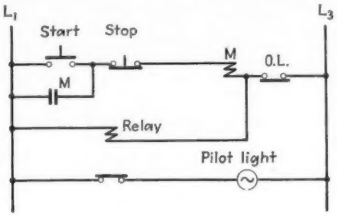
netic starter and showing how a pilot light can be connected to operate when the motor trips out on overload.

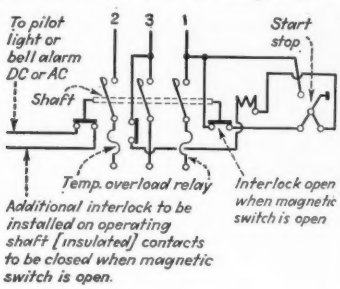
A normally closed relay is connected as shown with its coil in series with the starter overload contact. The normally closed contact of the relay is connected across the line in series with the pilot light. Normally the relay coil is energized, whether or not the motor is



running, holding its contact open and the pilot light is not lighted. When an overload occurs, the overload contact is opened, de-energizing the relay which in turn closes its contact lighting the pilot light. Resetting the overload relay automatically shuts off the pilot light.

Some starters are connected with the overload contact between the stop button and the operating coil. In this case the starter will have to be reconnected as shown in the diagram so that the starter operating coil and the relay coil will not be connected in series.—D.C.C.

A. TO QUESTION 84. I have installed additional interlocks on several magnetic switches. Usually these are made up from small miscellaneous parts in the shop and clamped to the


To pilot light or bell alarm DC or AC
2
3
1
Start stop
Shaft
M
Temp. overload relay
Interlock open when magnetic switch is open
Additional interlock to be installed on operating shaft [insulated] contacts to be closed when magnetic switch is open.

insulated shaft and arranged to close circuit when switch is open. These contacts operate pilot lights and alarm bells either a.c. or d.c. See diagram above.—J.W.B.

A. TO QUESTION 84. I assume that this is a 220 volt, 3 phase motor, but the voltage doesn't matter. This will work on any voltage providing the coil corresponds, and the proper resistance is used with the lamp. Of course, there are several choices for the pilot.

1. A lamp of the proper voltage to fit the circuit.

2. A 110 volt lamp with a 50,000 ohm

STANDARD *or* UNDERSIZE

JOHNSON LEADED BRONZE BEARINGS

Compare the installation costs with the purchase price of bearings and you will readily see why quality should be your first consideration. It's the long, trouble-free hours of operation that determines real value. Johnson Electric Motor Bearings are the highest quality possible. They are available from stock for more than 250 motors—either standard size or undersize. Write for our new catalogue.

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MEASURES
A.C. CURRENT—UP TO 30 AMPERES
A.C. AND D.C. VOLTS—UP TO 1500 VOLTS
RESISTANCES—UP TO 2500 OHMS

★ Completely portable—operates on self-contained 1½ Volt standard dry cell—no external source of current required.
★ All calibrations printed directly on meter—no computations or charts.
★ Same scale used for both A.C. and D.C. Voltage measurements.
★ Resistances as low as 1/10th of an ohm and Voltages as low as 1 Volt can be easily read.

MODEL 560 comes housed in hand-rubbed wooden cabinet complete with portable cover, self-contained battery, test leads and instructions. Size 8½" x 7" x 4¼"; Shipping weight 7 pounds. Net Price..... $28.50

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MICA AND FIBERGLAS COMBINED
MICA PAPER
MICA CLOTH
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MICA AND ACETATE COMMUTATOR SEGMENTS
MICA AND RED ROPE PAPER
MICA AND FISH PAPER
MICA AND PAPER TAPE
MICA TUBING

Write for The IWI BLUE CATALOG!

All MACALLEN MICA Products Distributed by:
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WITH

Synthite* PX-5

Insulating Transformers, like the 8.3 KVA air cooled unit partly completed above, provide isolation of circuits having a potential difference of 30,000 volts. This certainly is of interest. To insure non-failing insulation, the manufacturer, Nothelfer Winding Laboratories of Trenton, New Jersey, specified DOLPH'S SYNTHITE PX-5 Black Baking Varnish for impregnation of all their windings.

SYNTHITE PX-5 cures by heat induced chemical polymerization, leaving no trapped solvents or uncured varnish even in the deepest interstices of large coils. Possessing excellent bonding properties, moisture resistance and high dielectric strength, it is ideally suited for use on the newer magnet wires and with Class B insulation.

Dolph's

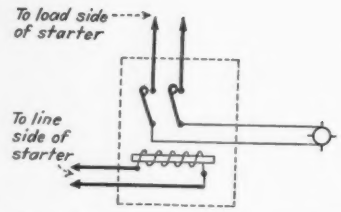
JOHN C. DOLPH COMPANY

Insulating Varnish Specialists

168-A Emmet St., Newark, New Jersey

Reader's QUIZ

[FROM PAGE 65]

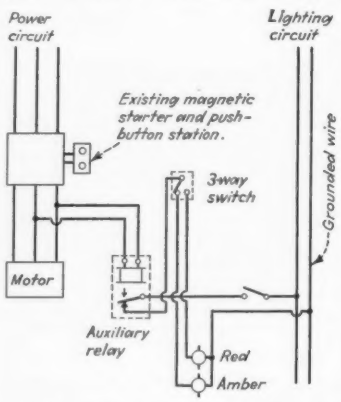


resistor (purchased from any radio store).

3. A neon glow lamp of proper voltage or with resistor.—R.L.

A. TO QUESTION 84. An auxiliary relay connected to two of the motor leads will operate a light when the magnetic switch opens under any condition. The coil should be wound for the same voltage as the motor. A set of contacts should be closed when the coil is de-energized.

An ordinary three-way switch placed near the motor control buttons can be used to give selective indications at a remote point. For instance, at the time of manually starting the motor, the attendant can set the switch so the red light will burn. When the motor is



manually stopped, he could turn the three-way switch so the amber light would burn. Thus, either light burning would indicate the motor was stopped, but the red light would show that stoppage was due to overload or power failure.

A battery substituted for the 110 volt line (and of course proper bulbs being used), will give indications in case of a general failure.

For relay wiring connected to power or lighting circuits, a single-pole switch or circuit breaker connected to the source as indicated, will provide safety for the maintenance man.—L.E.B.

Get the Most Out of

ELECTRICAL EQUIPMENT

.. by eliminating OVERHEATING

.. by quieting NOISY MOTORS

.. by preventing NEEDLESS WASTE

TURN TO

SUPERIOR BRUSHES!

For a given service, for each type of operating condition, and for each type of motor or generator, there is a grade of Superior Brush to satisfy the most rigid requirements.

The physical and electrical characteristics of Superior Brushes are determined by careful tests both in the laboratory and under actual operating conditions.

Standard methods of manufacture and laboratory control assure you that each lot of brushes will be consistently uniform.

Prompt attention given to all requests for engineering counsel.

SUPERIOR CARBON PRODUCTS, INC.

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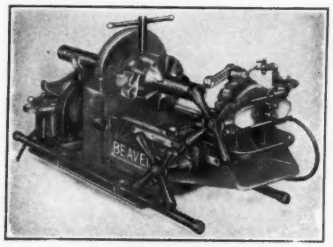
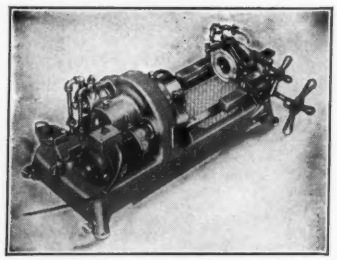
SCP

"All that the name implies"

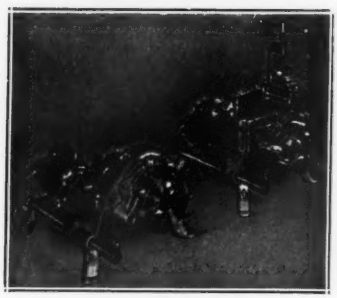
The A-B-C of . . .
Pipe and Bolt Machines!



Beaver Model-A
A high-speed heavy-duty deluxe Pipe and Bolt Machine. Range ⅛ to 2-inch-up to 12-inch with geared tools and drive shaft. Bolts, ¼ to 2-inch. Wt. 415 lbs.
Write for Bulletin A



Beaver Model-B
A light-weight utility Pipe and Bolt Machine combining many features of Model-A with the easy portability of Model-C. Range ⅛ to 2-inch up to 8-inch with drive shaft and geared tools. Bolts up to 1½-inch. Weight 280 lbs.
Write for Bulletin B



Beaver Model-C
A STURDY LITTLE POWER UNIT Converts hand pipe tools into power tools from ¼ to 8-inch. Threads 8-inch in 6 minutes. Threads bolts up to 1½-inch. Two men can work at the same time without interference. Weight 150 lbs.
Write for Bulletin C

Write for new Tool and Machine Catalogue—Just off the press

BEAVER PIPE TOOLS
242 Deen Ave., Warren, O.

A. TO QUESTION 84. I believe that I have two solutions that may answer your question and solve your problem.

Fig. 1 shows the usual hook-up for across-the-line starters. The current entering terminal A travels to start button through the holding coil and back to the other side of the line. When the starter is closed the holding current travels from A to C to D to B to button through the coil and back to the other side of the line. Now just what changes must be made in order to meet your case. Let us take a look at fig. 2.

Fig. 2 shows the change and addition that will do this without the use of relays. It is possible that you haven't

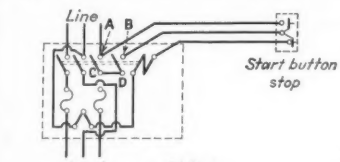


FIG. 1

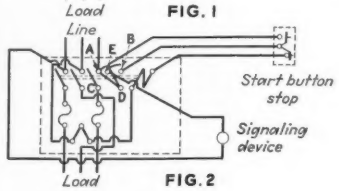


FIG. 2

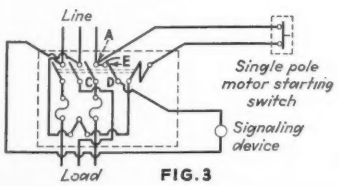
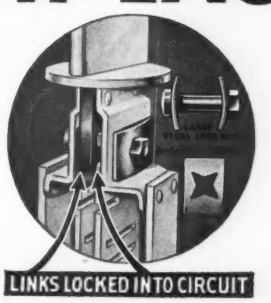


FIG. 3

the space in which to mount relays, I don't know that. In fig. 2 I move the jumper C D in fig. 1 to A D in fig. 2. I added the contactor E which is mounted separately on the board and has no electrical connection at all. A contact must be added to the front side of the contactor arm so as to make contact with E when the starter is open. The holding current circuit then becomes A to D to B to button to the coil and back to the other side of the line. This hook-up gives no voltage protection the same hook-up in fig. 1.

Fig. 3 is a hook-up using a single pole starting switch. The changes that I made was the elimination of the contact B and the line B G. A contactor E is mounted on the board the same as in fig. 2 and a contact is put on the front side of the contact arm. It may be possible for you to turn the contact arm around so that the contact will make with E when the starter is open. The jumper in fig. 1, I moved up to A E. The signalling circuit then becomes D to the device to the other side of the line. The holding circuit is A to button to coil and back to the other side

WARE HI-LAG



NON-HEATING CONTACTS
Keep Motors Humming

- End Over-Heating
- Stop needless fuse blowing
- Time-Lag 2 to 5 Times Normal Current
- Certified to Comply—Federal Specification W F 803a-Type II

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Renewable
HI-LAG FUSES

"GORILLA GRIPS"

A CONNECTOR FOR EVERY CONNECTION WHEREVER IT TAPS OR TERMINATES.

"SCRUWEDGE" STOCK SET

The "Scruwedge" Stock Set is the ideal way of carrying a complete inventory of small size connectors directly to the job so the electrician is ready for any emergency.

"GORILLA GRIP" STOCK SET

"Gorilla Grip" Stock Sets provide a method of stocking heavier types of lugs and mechanical connectors for emergency uses. The standard set makes 125 combinations, or a set may be built to meet your plant requirements.

Write today for "Gorilla Grip" booklet.

National Electric PRODUCTS CORPORATION Pittsburgh, Pa.

Reader's QUIZ

[FROM PAGE 67]

of the line. This circuit has also eliminated the no-voltage release and if the voltage should drop to a level too low to hold the starter closed it would drop out and the instant that it was restored to normal the machine would start. Single pole motor starting switches can be bought that incorporate the no-voltage release feature in the switch itself.—W.J.F.

Can You ANSWER these QUESTIONS?

QUESTION N3 —Having two magnetic switches for two 7½ hp., 220 volt, 3-phase motors, what wiring would you make to aid in the protection of a mercoid single pole switch that would disconnect both motors? Both starters have one starting-stop station.—W.J.L.

QUESTION P3—We have a two hp., two phase, 220-volt, 60 cycle squirrel cage induction motor. I would like to operate this motor on a 3-phase, 220 volt, 60 cycle circuit. How should this motor be connected, and what effect will it have on the motor?—R.E.P.

QUESTION Q3—How would you figure the average size of a field discharge resistance to be used on a magnetic pulley using two amperes at 120 volts direct current.—W.L.C.

QUESTION R3 —Is it ever advisable to use a solid wire as a form to make duplicate bends in conduit? Some say it would save a lot of time and material if there were to be three or four bends between two boxes, especially when the bends were close together.—F.R.B.

QUESTION S3 —In the past at our saw mill, we have operated a 120 volt d.c. generator 5 kva. for lights and a few small motors in filing room. Now this generator is in bad shape and I have a chance to buy practically a new d.c. machine where another mill has cut out, but this machine is 240 volts, 8 kva. I would like to have the 240 for one motor on the job, but would like to know how to cut this 240 to 120 for the rest of our operation, as our equipment and lights are 120 volts.

As we will not have over 1500 hundred feet of line one way from generator, could we use a transformer?—R.M.H.

PLEASE SEND IN YOUR ANSWERS BY MARCH 1

Save Time! Save Metals!

TRICO COLORTOP FUSES

● All colored top—color tells the size. Easy selection — quick inspection.

● Non-metallic top saves critical material for war effort.

Insist upon COLORTOPS!

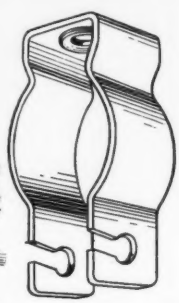
TRICO FUSE PULLERS

For cheap insurance against accidents, shock, burns, infection use a TRICO FUSE PULLER. Install them on all jobs.

Write for Bulletin No. 5

TRICO FUSE MFG. CO., Milwaukee, Wis.
In Canada: IRVING SMITH LIMITED, Montreal

SPEED UP CONVERSION and MODERNIZATION WITH PAINE IMPROVED CONDUIT CLAMPS



Available for rigid and thin wall conduit complete with correct size stove bolt for handy installation.

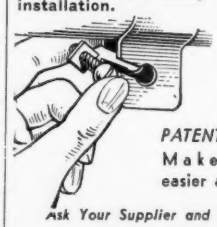


Fig. 445

PATENTED SLOT

Makes Installation faster, easier and better.

Ask Your Supplier and Write for Catalog

THE PAINE CO.

2961 Carroll Ave. Chicago, Illinois

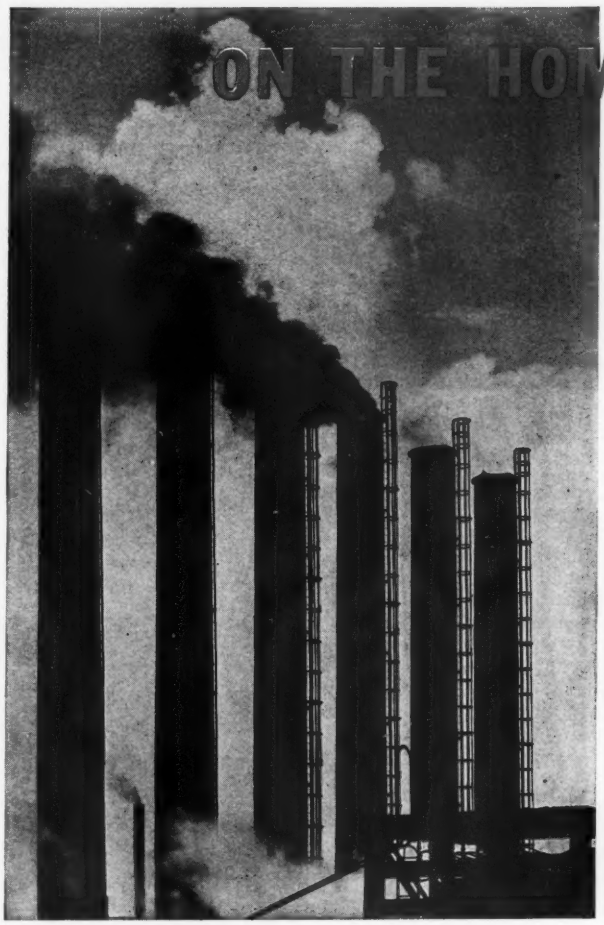
Offices in Principal Cities

PAINE FASTENING and HANGING DEVICES

VARNISHED CAMBRIC · RUBBER POWER CABLES · BUILDING WIRE · RADIO WIRES · SIGNAL CABLE · FLEXIBLE CORDS · LEAD-ENCASED AND PARKWAY CABLES · ARMORED CABLE · CRESFLEX NON-METALLIC SHEATHED CABLE · SERVICE ENTRANCE CABLE · MAGNET WIRE · BARE WIRE

CRESCENT

is Helping To Win This War



ON THE HOME FRONT, TOO

In thousands of factories and shops whose production is devoted 100% to the war effort, power is supplied through CRESCENT Wire and Cable.

CRESCENT INSULATED WIRE & CABLE CO.

Ask Your Jobber For

CRESCENT
WIRE and CABLE
Factory: TRENTON, N. J.—*Stocks in Principal Cities*

CRESCENT ENDURITE SUPER-AGING INSULATION · WEATHER-PROOF WIRE

Motor Shops

TRIPLE BAKE OVENS

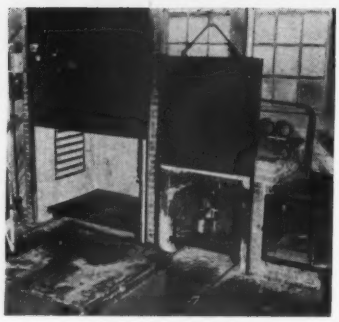
Economy of time and current are affected in the motor repair shop of Anderson's, Inc., Nashville, Tenn., by the use of a triple bake oven comprising electric ovens of three different sizes, all insulated by tandem brick enclosures.

Each oven is heated by a separate set of "Chromolox" electric space heaters mounted on the sides and floor of the oven. The large oven, capable of baking up to a 200 hp. motor, is rated at 18,000 watts; the medium, 100 hp. oven is rated at 10,000 watts; and the small five-hp. oven has 4,000 watts of heater elements. Each oven is separately controlled by magnetic contact Mercoid switches which permit heat control to within a two to three degree accuracy. Separate vents from each oven draw out any fumes that might be generated.

The medium and large ovens are served by flanged wheeled platforms on tracks. After the work is dipped in the tank in front of the ovens, it is placed on the truck and rolled into the oven. Work is lifted into the small oven.

One interesting feature of the small oven, is that it originally was a small office safe. After its useful life as a safeguard of valuables expired it gained a new lease on life as a bake oven in the shop department. This is just another example of applying and converting apparently scrap equipment to a useful purpose during wartime shortages of essential materials and equipment.

SAFE OVEN. *Close-up view shows old office safe converted into a small electric bake oven, enclosed by insulating brick. Heater units are on oven floor under equipment grate.*

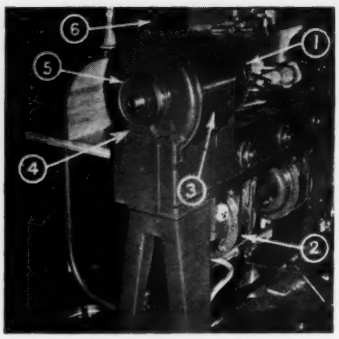


TANDEM OVENS *of three different sizes can accommodate motors from 5 hp. to 200 hp. in size. All are electrically heated and automatically controlled. Biggest ovens are used only for large motors.*

VARIABLE VOLTAGE WINDING LATHE

Although difficult to believe, the piece of machinery illustrated in the attendant pictures was once a junked lathe. The Mielke Electric Works, Inc., enterprising motor service shop of Duluth, Minn., picked it up and rebuilt it into a winding lathe that does everything but talk.

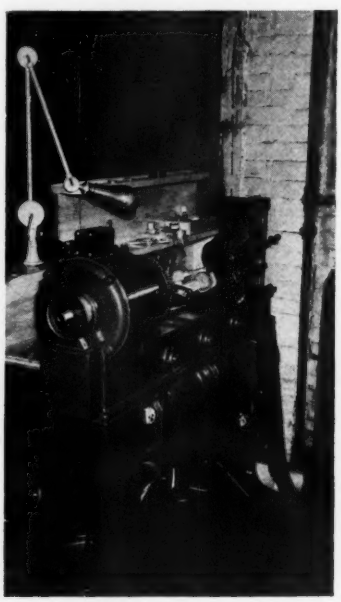
They equipped it with a new direct current motor drive, operated by a small motor-generator set mounted to the underside of the lathe bed. Speed variations from 10 rpm. to 3000 rpm. are obtained through variable-voltage speed control. The driving motor speed is controlled by pressure applied to a foot treadle—the speed increasing with the pressure on the treadle. The motor is equipped with a start-off-reverse switch. When in the "off" position, pressure on the foot treadle releases the solenoid brake and permits the winding head to be hand operated



OPERATING FEATURES *of this winding lathe are (1) spring-sheave hand wheel; (2) motor-generator set which, through variable-voltage control, operates (3) direct current motor; (4) solenoid brake; (5) brake sheave; (6) three-point motor switch.*

A solenoid brake, also controlled by the foot treadle, stops the motor and head when desired. The brake is of the friction type, consisting of an ordinary sheave on the end of the motor shaft; a solenoid operated block with an up-and-down motion; a short piece of V-belt attached to the top of the block. When the brake is on the V-belt section is held snugly in the groove of the sheave by the solenoid; when off, the block drops out releasing the sheave.

A second sheave of larger diameter,



TRANSFORMED *from an obsolete lathe ready for the junk pile, into a modern efficient bit of shop equipment. This rebuilt variable voltage winding lathe has increased the productive capacity of the Mielke Electric Works shop in Duluth.*

UMI

Helping American War Industries to

PROTECT MANPOWER

is an important part of our

WAR TASK

How Benjamin Lighting Equipment is Being Used to Help Promote Safety, Combat Fatigue and Conserve Manpower

There are 3 major ways in which the right kind of lighting as provided by Benjamin Lighting Equipment is helping American Industry to meet the manpower problems involved in war production.

+1. It protects plant personnel against accidents

+2. It conserves energy and reduces fatigue

+3. It helps older employees to "stay on the job."

1. SAFETY. Today the Safety problem is accentuated by the influx into industry of new, inexperienced men and women, many of whom are unaccustomed to industrial occupations, and by the increase in the average age of the working force. Also, demands for sustained, high speed production and day and night shifts have increased the problem of fatigue as a cause of accidents.

Good Lighting is helping in the solution of this problem in two ways. First, enough light enables the individual to see hazards easier and more quickly.° It takes time to see.** The more light the less time required to see and to act.** The fewer accidents!°°

Second, Good Lighting makes seeing easier and less tiring. The elimination of direct and reflected glare, deep shadows and spotty lighting, and the provision of sufficient light, properly directed, diffused and uniformly distributed help minimize eyestrain and fatigue,*** the enemies of alertness against accidents.

2. FATIGUE. Not only is fatigue the cause of accidents but also an important factor in rate and quality of production, absenteeism, health and morale. Lighting is helping to solve the fatigue problem by reducing the drain on the worker's reserve energy. For seeing requires energy!*** The better the lighting, the less the drain.***

3. OLDER EMPLOYEES. Good Lighting benefits the older employee and those with deficient vision of all ages even more than those with normal vision. **** More light helps compensate for visual deficiencies and the loss of visual acuity due to age. Given this additional light, the manpower represented by this large group can be conserved and efficiently utilized for war production.°

+ For data and case reports on the value of Good Lighting, send for the new report of the Illuminating Engineering Society, "Value of Good Lighting in War Production—A Survey of Opinion from a Cross Section of American Industry." For your complimentary copy, address:

BENJAMIN ELECTRIC MFG. CO.
Division H, Des Plaines, Illinois

BENJAMIN PRODUCTS

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INDUSTRIAL LIGHTING EQUIPMENT
including fluorescent, incandescent and mercury lamp units

EXPLOSION-PROOF UNITS
DUST-TIGHT UNITS
VAPOR-TIGHT UNITS
FLOODLIGHTING EQUIPMENT

*

MARINE LIGHTING EQUIPMENT
MARINE WIRING DEVICES

*

SOCKETS AND OTHER WIRING DEVICES

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SIGNAL EQUIPMENT
including Sirens, Horns, Buzzers and Telecode Relays

*

If you have a problem relating to the use of any of the above products, write the Benjamin Electric Mfg. Co., Product Information Department (Division H), Des Plaines, Ill., for data and recommendations. Benjamin services in the solution of such problems are available without cost or obligation of any kind.

FOR VICTORY BUY UNITED STATES WAR BONDS AND STAMPS

*From I.E.S. Report: "Artificial Lighting in War Production."

**It takes time to see. Tests show that when the amount of light is increased from 1 to 100 footcandles, the speed of seeing is practically doubled.

***Researches reveal that muscular fatigue produced by reading is approximately three times as great after reading for an hour under 1 footcandle as at 100 footcandles.

****In one comprehensive series of tests, those with better eyes were aided 14 per cent by better lighting, while those with defective eyes were aided 22 per cent.

°From Booklet "Plant Efficiency" published by War Production Board.

°°Striking examples of close relationship between quality of lighting and frequency of accidents are not difficult to find. For example, when intensity of illumination . . . in one company . . . was raised from 1.5 footcandles to 19 footcandles . . . the frequency of minor accidents quickly dropped nearly 54%.

BENJAMIN

TRADE MARK

LIGHTING EQUIPMENT

When you sell
QUAD
LIGHTING UNITS
BEARING THE
RLM LABEL
YOU SELL CUSTOMER
Satisfaction

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NO. 1184-M
RLM THREADED
DOME REFLECTOR

★ QUAD Units all have correct basic design and construction features. The RLM Label on QUAD Lighting Units assures your customers of modern, correct, and high quality commercial and industrial lighting. It's the line that will be popular tomorrow as well as today.

•

QUADRANGLE MFG. COMPANY
32 SO. PEORIA ST. CHICAGO, ILL.

[FROM PAGE 70]

mounted to the motor shaft at the winding head end is used for hand operation of the lathe. A hand grip is provided by a coil spring around the circumference of the sheave and spot welded to the groove.

A bench with a backboard and two small shelves is added to the back of the lathe. Small tools and other accessories are kept on the shelves. An adjustable arm localized lighting unit provides concentrated illumination where needed on the machine.

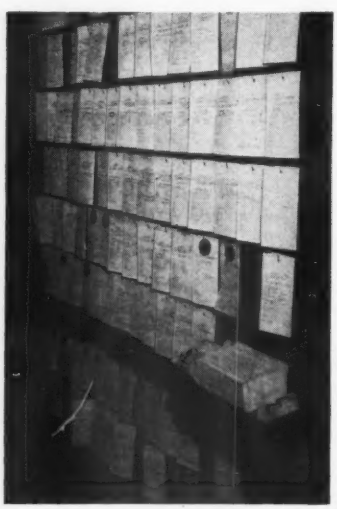
A little ingenuity, a couple of motors and some fine workmanship has transformed an old lathe, that might have been sold for scrap, into a highly efficient modern piece of motor shop equipment. It is an outstanding example of what we can do today, when machinery is hard to get and our war work piles up. It's making the best of what we have.

LIVE ORDER BOARD

To keep motor data cards intact and free from the grease and dirt that invariably smudges them when following a repair job through the shop, the M. J. Torrance Electrical Supplies Co., Inc., motor repair organization of Rock Island, Ill., uses a "live order board."

The board, located at the front of the shop where repair jobs enter, is equipped with rows of hooks and pigeon-holes with blank data cards and shipping tags. Each hook is equipped with one or more metal tags with duplicate numbers stamped on them. A different number is assigned to each hook. The general idea is to leave the data card for a particular motor on the board and attach the numbered metal tag to the motor or parts.

When a motor comes into the shop a data card is filled out, giving the order number, tag number, customer name and address, nameplate rating of motor, winding data, other pertinent information, date received, promised, completed and tested and the name of the mechanic. When the job is finished, the metal tags replace the data card which is filed, a shipping tag is fastened to the equipment and it is ready for the customer. The clean, legible data cards make up the permanent file without duplication of effort.



***ON THE HOOK** until job is completed, these data cards are kept clean and legible. Then they go into a permanent file. Correspondingly numbered metal tags follow the work through the shop.*

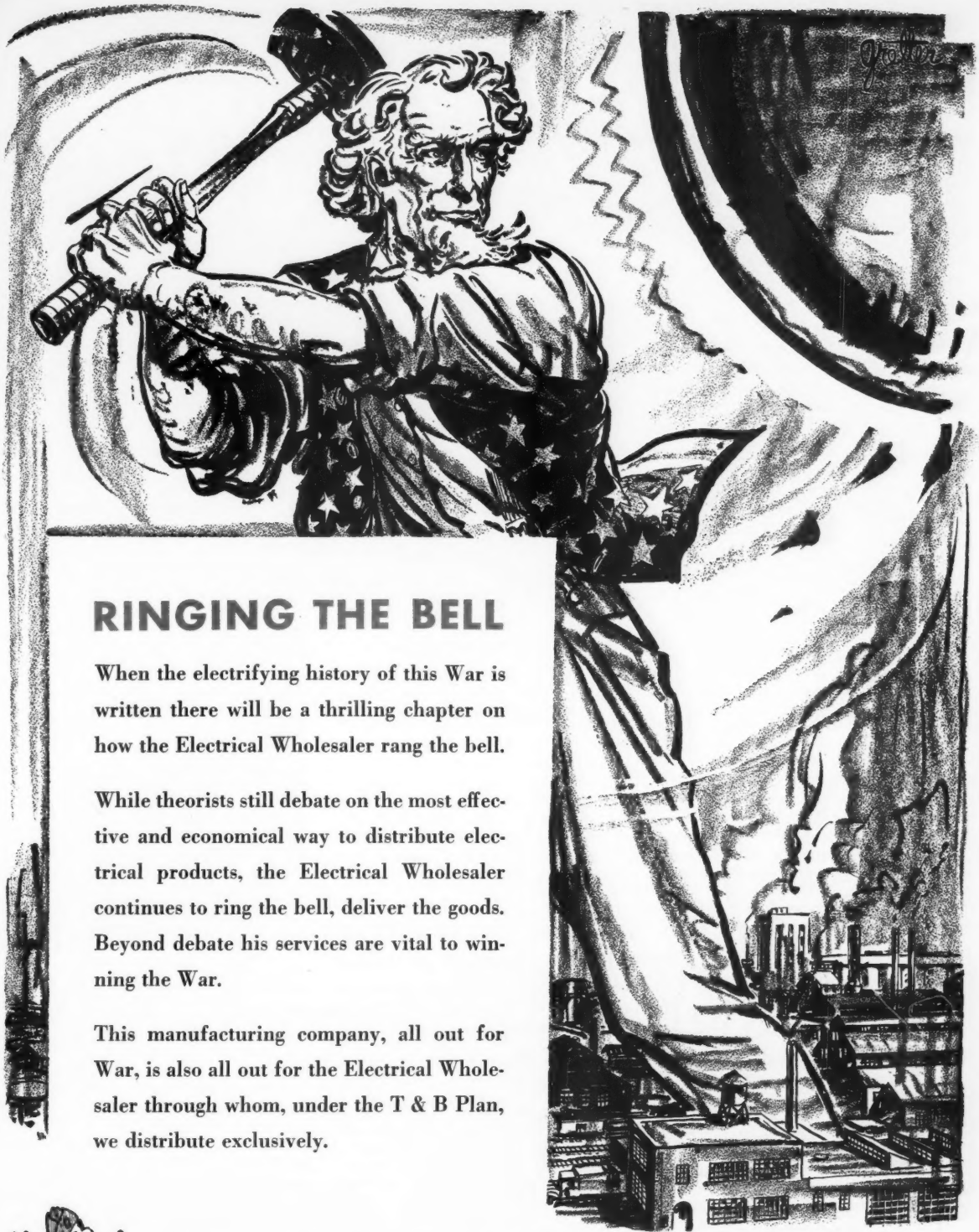
***FOR MANEUVERING** heavy equipment a large floor crane saves many a backache, manhours, and prevents serious accidents in the repair shop of Electro Service, Inc., Union City, N. J. here the floor crane joins hands with a stationary chain block in lowering a 400 hp. rotor on a lathe bed.*

Order No.	Tag
Customer	
Address	
Make	
H.P. RPM	Ph.
Serial	Volts
Type	Form
Frame	Amps.
Style	Model
Other No.	Cycle
Complete Motor	
Stator Only	
Armature Only	
Slide Base	
Pulley	
Gear	
Coupling	
Sprocket	
Other Information	

Slip Ring	
Totally Enc.	
Explosion Prf.	
Splash Prf.	
Centrifugal	
Replacation Ind.	
Sleeve Bearing	
Ball Bearing	
Winding Data	
No. Slots	No. Coils
Wire Size	No. Turns
Conn.	Span.
Other Data	
Date Rec.	
Date Promised	
Date Finished	
Complete Test	
By	

***FOLDING CARDS**, after being filled out with pertinent data, are placed on the "live order" board and remain there until job is finished. Cards are replaced by metal tags when job is completed, then are filed.*

UMI



RINGING THE BELL

When the electrifying history of this War is written there will be a thrilling chapter on how the Electrical Wholesaler rang the bell.

While theorists still debate on the most effective and economical way to distribute electrical products, the Electrical Wholesaler continues to ring the bell, deliver the goods. Beyond debate his services are vital to winning the War.

This manufacturing company, all out for War, is also all out for the Electrical Wholesaler through whom, under the T & B Plan, we distribute exclusively.

T&B

THE THOMAS & BETTS CO.

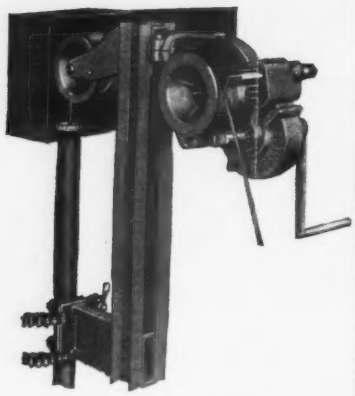
INCORPORATED

MANUFACTURERS OF ELECTRICAL FITTINGS SINCE 1899

ELIZABETH, NEW JERSEY

In Canada: The Thomas & Betts Co. Ltd. Montreal

TO HELP THE ELECTRICIAN GET MORE WORK DONE!



A BENDER FOR ANY JOB

• There's a Greenlee Bender for any of your bending jobs. Small hand benders and powerful hydraulic benders for conduit, pipe, and tubing from ¼ to 4½-inch size. Greenlee Hydraulic Benders are easily operated by one man . . . save the cost of many manufactured bends and fittings . . . are compactly built in one unit . . . and are easily carried to the job and set up. The No. 770 Bender, shown here, will bend 1¼ to 3-inch pipe while the No. 775 Bender will handle 3 to 4½-inch material.

PULL CABLE EASIER AND FASTER

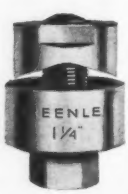
• The Greenlee Cable Puller will save many hours of work when pulling in cable. This handy tool clamps right on to the conduit through which cable is pulled . . . is easily carried to the job . . . can be set up in a jiffy . . . and is easy for one man to operate with one or two hand cranks. This cable puller, with a maximum pull of 7500 pounds and with two speeds, can be clamped to 2 to 5-inch conduit.

SEND FOR GREENLEE CATALOG 33-E

• Write for free copy of this valuable reference and buying guide to the complete line of Greenlee Tools for the Electrical worker.

ENLARGE HOLES without drilling, reaming or filing

• Greenlee Knockout Punches and Cutters will enlarge holes in metal up to ⅛-inch thick without long tedious drilling and filing. A Knockout Cutter or Punch is inserted in a knockout or a small drilled hole, a few turns of the drive nut with an ordinary wrench, and a hole up to 3½ inches can be cut in 1½ minutes or less.



GREENLEE TOOL CO.

1742 COLUMBIA AVENUE • ROCKFORD, ILL.

Motor Shops

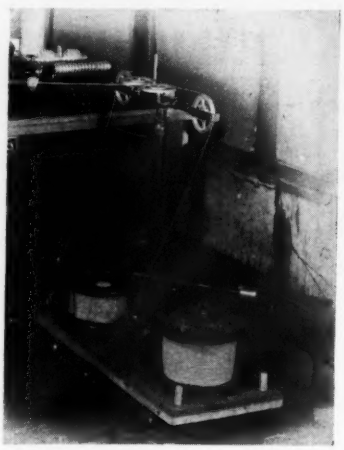
[FROM PAGE 72]

PORTABLE PAY-OUT REEL

A portable magnet wire pay-out reel for use in a motor shop was designed by the Mielke Electric Works, Inc., motor service shop of Duluth, Minn. It was designed primarily to keep magnet wire from twisting and kinking at the reel when fed into a winding head.

The component parts of the unit include a wood platform rolling on four casters. Mounted to the center of the platform is a "T" shaped pipe stanchion equipped with four sheaves; two in a vertical plane—one at each end of the "T"; two in a horizontal plane at the intersection of the "T". Small agate fishing pole tips guide the magnet wire to and from the sheaves.

The wood platform accommodates two reels of wire resting on their sides. The tops of the reels are equipped with a ball bearing mounted swinging arm constructed of an "L" shaped section of small pipe. The base of the L extends down along the wire on the reel and contains a small sheave through which the wire is threaded. The tail of the pipe section is equipped with a counterweight so the arm will swing freely around the reel as the wire is payed out.

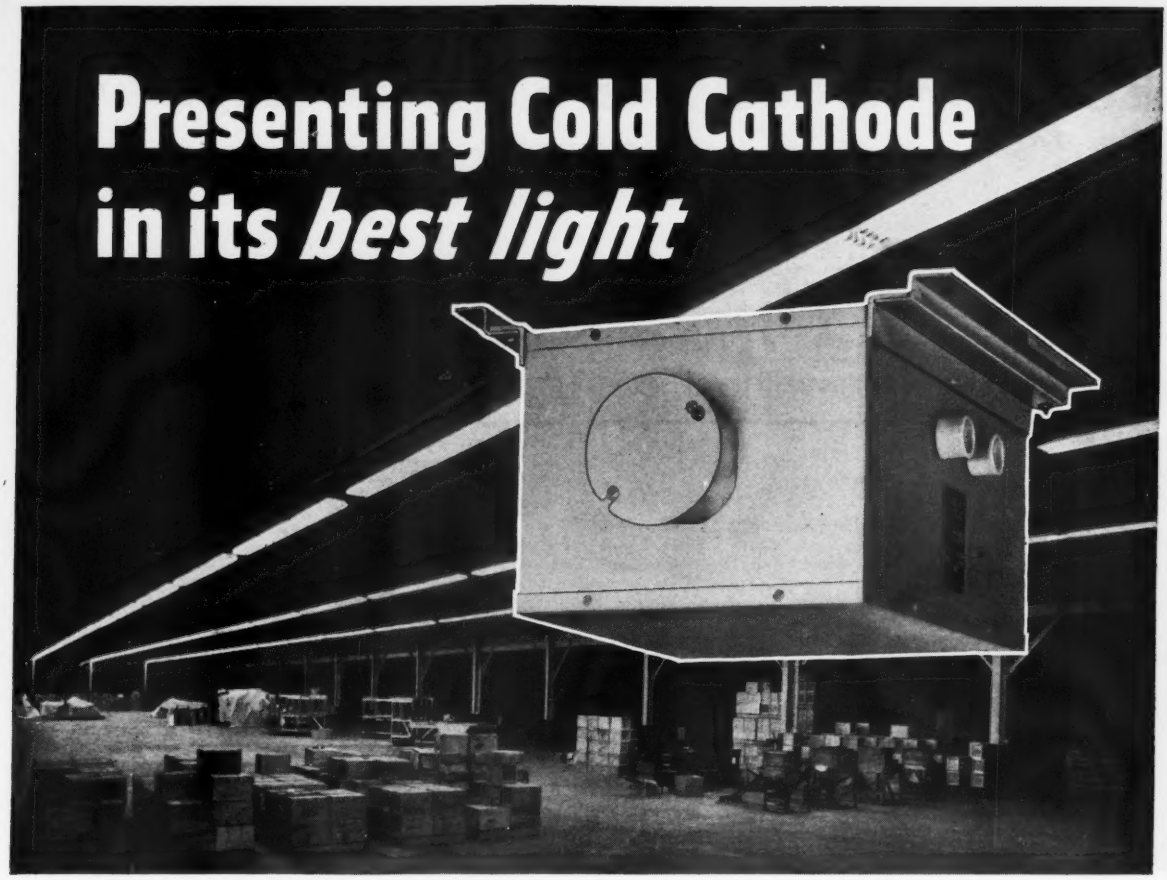


ANTI-KINK PAYOUT reel unit keeps magnet wire from becoming twisted and kinked while being fed into winding machines. Swinging arms follow wire around reel as it unwinds. Unit can be moved to any machine in the shop.

As the wire is fed into the winding head of either armature or coil winding machines, the swinging arms rotate around the reel paying out the wire without danger of it becoming twisted or kinked. The entire unit can be rolled to any winding machine in the shop.

UMI

Presenting Cold Cathode in its *best light*



WAR WORK was made to order for cold cathode lighting. This "rugged" type of illumination is unaffected by shock or vibration. It requires a minimum of critical materials. And, properly installed, it can produce the steady volume of non-glaring, non-tiring, shadowless light so necessary for precision operation.

But remember this: When you make an installation today, you are often introducing cold cathode lighting to someone for the first time. For the sake of your business, be *sure* you are presenting this money-and-material-saving medium in its "best light". Don't take chances.

Rely on efficient, sturdily-engineered Sola Transformers. They are an assurance that your installation will "stay on the beam"—will deliver a constant intensity without overload hazards or low-voltage flicker. They are an assurance of trouble-free operation, uniform high performance and business-building goodwill.

Every significant improvement in luminous tube transformer construction during the past twelve years has originated in Sola laboratories. Find out how Sola can help you engineer for victory—and for profitable business when the guns are stilled. *Send for bulletin JLT-96.*

SOLA Cold Cathode Lighting Transformers

Transformers for: Constant Voltage • Cold Cathode Lighting • Mercury Lamps • Series Lighting • Fluorescent Lighting • X-ray Equipment • Luminous Tube Signs Oil Burner Ignition • Radio • Power • Controls • Signal Systems • Door Bells and Chimes • etc. **SOLA ELECTRIC CO., 2525 Clybourn Ave., Chicago, Ill.**

Keep Up-to-Date on new developments through this FREE SERVICE.....

Electrical Contracting brings you the latest literature of leading manufacturers without cost or obligation.

MOTOR FINDER

1 A new "Motor Finder" slide-rule for quickly selecting various types of squirrel-cage motors. User is able to match conditions under which motor must operate at proposed installation with required motor characteristics and instantly learn right motor type and its features. Allis-Chalmers Mfg. Co.

INSULATING VARNISH

2 A new insulating varnish catalog containing data on over 40 different materials, each graphically described in easy-to-read charts. P. D. George Company

SWITCH

3 Bulletin 42-12 illustrating and describing the new 575 volt Rolarc safety switch. Federal Electric Products Company, Inc.

LIGHTING EQUIPMENT

4 Catalog No. 43-S, consists of 16 pages and describes lighting equipment for combat operation and war production. Many illustrations are shown. F. W. Wakefield Brass Company

WIRE

5 A sample folder on synthetic insulated wire. It explains features of "Synthetic" and lists suggestions for its use. Data regarding colors and sizes is given. Walker Brothers

FLUORESCENT LIGHTING

6 A new folder for plant superintendents and operating executives on the subject of "Relighting with Fluorescent in Wartime". Illustrations are given of newer type non-metallic fluorescent lighting units. Edwin F. Guth Company

ELECTRONICS

7 A new booklet telling how the electron is working today in war combat to perform many functions; in industry to step up production, increase human efficiency and reduce waste; in radio and television; in agriculture to improve quantity and quality. General Electric Co.

MOTORS

8 Bulletin 30 is on the care and maintenance of fractional horsepower motors. Each problem and procedure is illustrated with photographs, cutaway views and diagrams. The Dumore Company

COPPER RULE

9 A calculator that works like a slide rule to show how much copper can be saved in a war plant electric power system by installing unit **substations at the centers of the load areas.** General Electric Co.

RESISTANCE MATERIAL

10 A new folder on suggested applications and blueprints of negative temperature coefficient resistance material. Keystone Carbon Co. Inc.

DRILLS

11 A new handbook on the proper use and care of portable electric drills. It covers such points as assembling the drill, switch control, drill chucks and bits. The Black & Decker Mfg. Co.

MOTORS

12 A folder illustrating and describing practical helps on wartime selection of electric motors. Allis-Chalmers Mfg. Company

WELDING ACCESSORIES

13 A new bulletin, GEA-3295, entitled "Arc Welding Accessories for Women". It describes and illustrates the complete line of safety clothing and equipment. General Electric Company

LIGHTING FIXTURE

14 A new bulletin illustrating and describing "Synthetic" fluorescent lighting units for use in defense plants. Eastern Fixture Company

DRIVE CONTROL

15 Booklet B-3123 features the Rototrol d.c. drive control, for use where wide speed range or close regulation is required. Charts, diagrams and photographs explain how the Rototrol regulates. Westinghouse Elec. & Mfg. Co.

[Continued on Page 78]

Circle numbers, sign and paste on your letterhead and mail in an envelope.

ELECTRICAL CONTRACTING **February**
330 West 42d St.
New York, N. Y. **(Not good after April 1)**

Please send me without obligation, manufacturers' literature herein described and identified by numbers circled below.

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
31 32 33 34 35

NAME ..... TITLE .....

COMPANY .....

ADDRESS .....

CITY ..... STATE .....

UMI

APPLETON Engineering Skill PERFECTS...

Modern Explosion-Proof Fluorescent Lighting Increases Night-shift Production in Chemical Plants and Other Hazardous Locations.

Explosion-Proof FLUORESCENT LIGHTING

NOW... BETTER LIGHT STEPS UP WAR PRODUCTION IN VITAL HAZARDOUS LOCATIONS!

Powder Mills, oil refineries, chemical plants, rubber plants—all of the hazardous locations where top-capacity, day-and-night war production is imperative—can now have modern, fluorescent lighting in the safety of Appleton Explosion-Proof Equipment!

Recently perfected by skilled Appleton engineers, Appleton Explosion-Proof Fluorescent Lighting Fixtures have been designed for use in Class I, Groups C and D, also Class II, Group G hazardous locations.

Lamps, starters and ballast are easily, quickly accessible; maintenance cost is low. All factory connections are made to terminal blocks; splices are eliminated. Two 48-inch, 40-watt lamps entirely enclosed in Pyrex tubes. Typical of the complete Appleton Explosion-Proof line, these sturdy, heavy-duty fixtures offer a *wide margin* of safety.

You can actively aid vital war production by checking the hazardous locations in your community where inadequate light may be slowing down night-shift war work—and by correcting that condition by installing Appleton Explosion-Proof Fluorescent equipment.

APPLETON ELECTRIC PRODUCTS — REG. U.S. PAT. OFF.

The *COMPLETE* Appleton line of "Unilets" and fittings includes hundreds of types meeting every requirement.

"STANDARD FOR BETTER WIRING"

Sold by Wholesalers

APPLETON ELECTRIC COMPANY

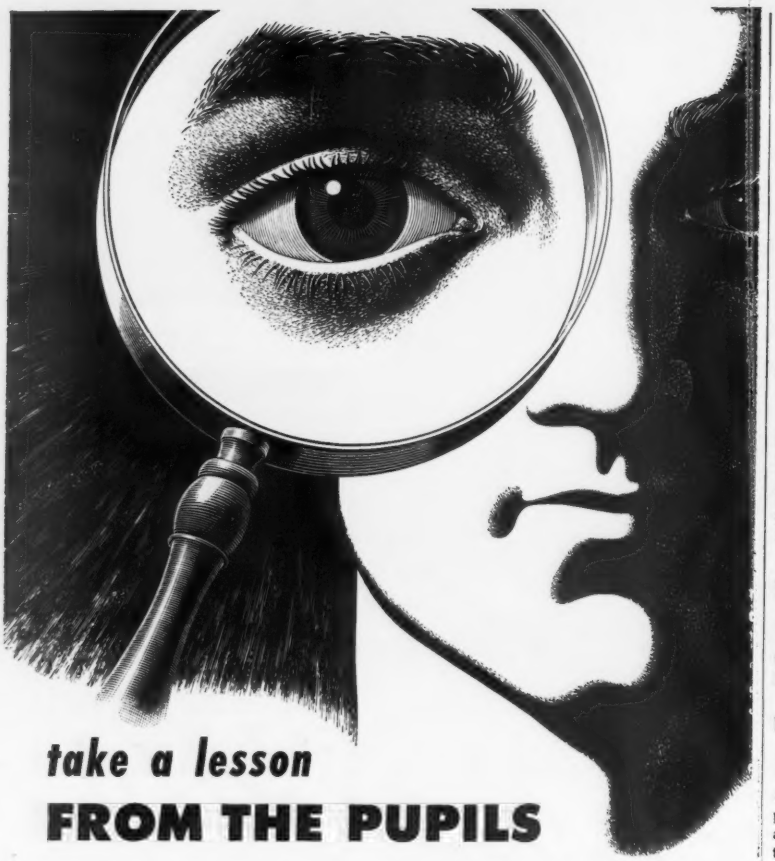
1704 WELLINGTON AVENUE • CHICAGO, ILLINOIS

Branch Offices: NEW YORK, 76 Ninth Avenue • DETROIT, 7310 Woodward Avenue CLEVELAND, 1836 Euclid Avenue • SAN FRANCISCO, 655 Minna Street • ST. LOUIS, 420 Frisco Bldg. • LOS ANGELES, 100 North Santa Fe Avenue • ATLANTA, 175 Luckie Street, N. W. • BIRMINGHAM, 6 N. Twenty-first Street • MINNEAPOLIS, 305 Fifth Street, S. • PITTSBURGH, 418 Bessemer Bldg.

Resident Representatives: Baltimore, Boston, Cincinnati, Dallas, Denver, Kansas City, Milwaukee, New Haven, New Orleans, Philadelphia, Seattle

APPLETON

CONDUIT FITTINGS • OUTLET AND SWITCH BOXES • EXPLOSION-PROOF FITTINGS • REELITES



take a lesson
FROM THE PUPILS

EYES are the skilled workman's most valuable tools. Because they normally react to varying intensities of light, doesn't mean that they can continuously do so over long periods without strain or fatigue.

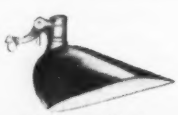
Under ideal seeing conditions, the pupils are small, vision is sharp. Reduce the amount of illumination and the pupils enlarge to allow more light to enter —vainly trying for a clear picture. This means that the eyes must work harder, tire sooner—and invariably slow up the worker's efficiency.

Higher intensities of illumination are no mere luxury. Industrial executives have learned this lesson and are speeding production, reducing fatigue and errors with lighting *properly designed* for every task.

Goodrich specialists in industrial illumination are at your service to solve these problems in vital war industries.

Highlite

Stocklite


Diffuso Floodlight

Seprable RLM Dome

RLM

Protecting vital plants with floodlighting—saving man-hours in production —Goodrich industrial fixtures are serving America's war effort everywhere.

LIGHTING FOR INDUSTRY
GOODRICH
ELECTRIC COMPANY
OFFICES IN ALL PRINCIPAL CITIES

GENERAL OFFICES AND FACTORY: 4602 BELLE PLAINE AVENUE, CHICAGO, ILL.
SOLD ONLY THROUGH ELECTRICAL WHOLESALERS

New Literature

[FROM PAGE 76]

FLUORESCENT UNITS

16 New Catalog Sheets L-78 pictures, describes and lists seven new industrial lighting units for use with fluorescent lamps. Masonite reflectors, non-metallic shielding eggcrates, "for-lamp" units, mechanic's portable and quick-starting units are included. Edwin F. Guth Company

SAFETY SWITCHES

17 Bulletin 500 consists of 24 pages, covering the design and listings of all types of safety switches for industrial applications. Includes Type A heavy duty industrial switches, Type C, general purpose switches, double throw switches and manual motor starters. Square D Company

INSTRUMENT

18 Bulletin No. 790 illustrates and describes model "J" hand tachometers, single range type. Herman H. Sticht Company, Inc.

RHEOSTATS

19 Bulletins 60A and 69 illustrates and describes vitrohm and ribohm field rheostats, and four-inch pressed steel rheostats with rectangular and round contacts. Ward Leonard Electric Co.

FLUORESCENT LIGHTING

20 Bulletin No. 42-11 is an eight-page folder entitled "Facts to Help You Plan Better Wartime Fluorescent Lighting". It includes photographs, drawings and diagrams. National Transformer Corporation.

VISIBILITY CALCULATOR

21 A new visibility calculator designed for use with the Luckiesh-Moss visibility meter. General Electric Company

SWITCHGEAR

22 Bulletin B6185 contains descriptions and illustrations of all indoor and outdoor type switchgear, with removable circuit breakers or fixed breakers. Allis-Chalmers Mfg. Co.

CONTROL DEVICES

23 A new catalog entitled "Air-Line" carries detailed descriptive and engineering information of compact devices including circuit breakers, switches, relays, contactors, pushbuttons, limit switches and special purpose devices. Square D Company

WELDING

24 Booklet B-3136 describes the Flexarc a.c. welders. It compares advantages of a.c. and d.c. welding. Westinghouse Electric & Manufacturing Company.

UMI

LIGHTING EQUIPMENT

25 A new 12-page booklet, Serial 2130, illustrates and describes lighting fixtures for use in industrial plants. It features both fluorescent and incandescent units. Curtis Lighting, Inc.

ANCHORING DEVICES

26 Catalog No. 42 consists of 28 pages of data on expansion bolts, anchors and accessories for highway, industrial and general use. American Expansion Bolt & Manufacturing Co.

SUBSTATIONS

27 Catalog GEA-3800 illustrating and describing master unit substations for incoming voltages 13,200 to 132,000 and outgoing voltages 2500 to 13,800. General Electric Co.

WELDING

28 Bulletin B-6049A tells how to weld thin metals with the Weld-O-Tron. It illustrates successful applications throughout industry, as well as for the Navy, Army and Air Corps. Allis-Chalmers Mfg. Co.

DRIVES

29 Catalog ED-42 consists of 36 pages of practical helps on power transmission. Blueprints, drive selection tables and dimension tables are given. American Pulley Company.

SWITCHBOARDS

30 A revised edition of Bulletin No. 3000 on circuit breaker and fusible switchboards. Many illustrations are shown. Square D Company

MOTORS

31 Booklet B-3188 is entitled "Calling All Horsepower" and shows how to save critical war materials and to get maximum production out of every motor. Westinghouse Electric & Mfg. Co.

TOOLS

32 Folders illustrating and describing electric brazer for brazing and soldering with silver solder; and an electric marker. Ideal Commutator Dresser Co.

CAPACITORS

33 Booklet GES-3039 tells how industrial plants can increase power capacity and save large quantities of critical materials by the use of capacitors. General Electric Company.

RESISTOR

34 Bulletin No. 23 illustrates and describes Vitrohm strip resistor and Bulletin No. 104 features midget metal base relays. Ward Leonard Electric Co.

INTER-COMMUNICATION SYSTEM

35 A new catalog consisting of eight pages of description and explanation of All-Master and Combination Master inter-communication Systems as well as paging systems. Talk-A-Phone Mfg. Co.

NO RESTRICTIONS ON Wire-Nuts

Solderless, Tapeless Wire Connectors

Immediately Available!

SAVE CRITICAL MATERIALS

Government restrictions on the use of critical materials for electrical connections do not affect IDEAL "Wire-Nuts"—because these solderless—tapeless connectors do not require lead, tin and rubber. Thousands of contractors making millions of wire joints have already standardized on "Wire-Nuts".

BETTER, Electrically; STRONGER, Mechanically!

IDEAL "Wire-Nuts" speed wiring, make BETTER wire joints—FASTER! The coil spring insert automatically compresses, twists and "threads" the wires and the "Wire-Nuts" together to make a joint several times stronger than soldered joints. FULLY APPROVED. Listed by Underwriters' Laboratories, Inc.

Sizes for Every Job, from small conduit fittings to sizes large enough to join 3 No. 10 wires. Ask your Electrical Jobber for Samples.

Other IDEAL War-Time Wiring Job Speeders

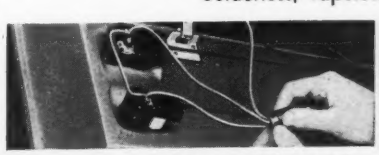
- Joist Borers
- Fish Tape Reels and Pullers
- Wire Strippers
- Cable Ripper
- Switch Box Supports
- BX Armor Cutter

PROMPT SHIPMENT

IDEAL

IDEAL COMMUTATOR DRESSER CO.
1041 Park Ave. Sycamore, Ill.
Sales Offices in All Principal Cities

Wire-Nuts®
Solderless, Tapeless Wire Connectors



Speed up Fluorescent Fixture Installations and Repairs with "Wire-Nuts". Pass inspection quickly.

Roughing-in is greatly simplified with "Wire-Nuts." No danger of fires or burned woodwork.

TOP EFFICIENCY with RLM Non-Metallic Reflectors!

Typical Wheeler convenience! Quick, easy access to operating parts by loosening two thumb-screws. Exclusive chain hangers support detached reflector. No loose screws, bolts or nuts to handle.

New "War-Aid" Fixtures insure availability of Wheeler SKILLED LIGHTING for war plants!

In spite of wartime metal scarcity, you can obtain fluorescent lighting fixtures with all the lighting efficiency and convenience of pre-war Wheeler "Skilled Lighting" units. Wheeler's 60 years' experience in better lighting has now produced top-standard "War-Aid" models requiring minimum metal!

Reflectors of "War-Aid" units are rugged non-metallic material. Non-flammable, moisture-resistant. Reflecting surfaces of chip-proof, washable baked enamel provide minimum efficiency of 80% in 48" 2-lamp units; 73% in 3-lamp units; and 73% in 60" 2-lamp units. Available for individual or continuous-run installations.

Write for full details of Wheeler "War-Aid" Fixtures and catalog of Incandescent Fixtures. **Wheeler Reflector Company, 275 Congress Street, Boston, Massachusetts.** New York . . Cleveland. Representatives in principal cities.

Distributed Exclusively Through Electrical Wholesalers

Wheeler REFLECTOR COMPANY

Lighting Equipment Specialists Since 1881

Speeding Lighting Maintenance

[FROM PAGE 25]

start at one aisle, work across and come down, move the bridge along and go back along another row of units.

3. *Crows' Nests*—This revolving aerial ladder works well on low bay lighting maintenance. The unit can be rolled down the aisles and the ladder reach over machines to get at the units.

4. *Rolling Stepladders*—Stepladders on wheels can do much to speed up lighting maintenance in low bay and office areas. When used with a two-man crew, one man can remain on the ladder doing the cleaning, while the ground man moves the ladder and the parts hand truck from unit to unit, testing the lamps and starters. Ladders with large work platforms and racks for holding the fixtures do the best job.

5. *Portable Hand Trucks*—A modification of the combination portable scaffold and spare parts cabinet, is the portable hand truck containing spare parts cabinets, shelves, fixture racks, tool drawers, and necessary test equipment.

Outdoor Lighting

Units are not equipped with drop hanger assemblies, they can be made easily accessible by one of the following methods.

1. *Crows' Nests*—Mounted on either caster bases, electric trucks or auto trucks eliminate the necessity of carrying, mounting and moving extension ladders to service each unit.

2. *Parapet Ladder Platforms*—These are combination hook ladders and platforms that hook over building parapets and allow the maintenance man to service outdoor lighting units mounted to the side of a building.

3. *Cycle Lamp Trimmers*—In one steel plant equipped with numerous outdoor open type reflector yard and floodlighting units, a "lamp trimmer" makes daily rounds on a bicycle equipped with a wire basket full of lamps. With the aid of a long pole lamp changer he replaces burned out lamps. One of the preceding methods must be used, however, to clean the reflectors.

Speed is essential to any type of industry maintenance program. Any plan that facilitates the servicing schedule without sacrificing thoroughness will do much toward maintaining wartime production standards. The schemes outlined above are offered as suggestive means of expediting lighting maintenance. Some of them may well augment present systems to that end.

UMI

Thou Shalt Not

Government Orders Affecting Electrical Wiring Construction

LIST OF PROHIBITED ITEMS FOR CONSTRUCTION WORK —Issued by Army and Navy Munitions Board—the basic document for practically all construction directives. For Electrical Wiring Construction it recommends, "Minimum type of wiring **without** metal boxes, Individual conductors supported as in the usual Knob and Tube Systems." It requires the use of Non-metallic outlet boxes, restricts and prohibits such other metal wiring materials as conduit and armored cable.

WAR DEPARTMENT, ENGINEERS CIRCULAR LETTER NO. 2122 —Requires conservation by the use of PORCELAIN outlet boxes and Knob and Tube Wiring, restricts the use of such metallic materials as conduit, armored cable, metal boxes, etc.

DIRECTIVE FOR WAR-TIME CONSTRUCTION —"Utilize those materials which are most plentiful and which will cause the least interference with production of combat material. **Electrical systems shall be of the simplest designs.**"

WAR HOUSING CRITICAL LIST —Stipulates the use of non-metallic wiring construction (Knob and Tube) and non-metallic type outlet boxes, restricts the use of metal in wiring construction.

WAR DEPARTMENT —Theatre of operations and Mobilization Construction Secs. XXXIII and XXXIV —Exterior and Interior Electrical Work—In general wiring systems shall be based on the use of open wiring on insulators, concealed Knob and Tube Wiring. Outlet Boxes shall be of Porcelain, composition. Secondary rack bases shall be of hard wood.

WPB-L-165 —Prohibits the manufacture of armored cable.

WPB-L-225 —Restricts the manufacture of conduit and prohibits its use in any construction except under special conditions.

WPB-M-126 —Prohibits the use of iron and steel material for housing, not otherwise specified in this order—except to the extent specified in War Housing Critical List.

ENFORCEMENT —The Spirit as well as the letter of these directives must be complied with. Violations must be followed by proper disciplinary action and imposition of suitable penalties.

The fulfillment of requirements for the War Effort has created shortages in the supply of such materials as copper, rubber, steel and other metals. The above orders, as they affect electrical wiring construction, were made only after it was assured that safety and efficiency would not be impaired.

It was only natural that the need for conservation should point to the use of Knob and Tube Wiring—for it not only uses the least amount of materials but its 50 year service record has proven its safety, efficiency, durability and economy. Porcelain outlet boxes and other porcelain wiring materials make practical the installation of a wiring system almost void of steel and reduce the amount of copper and rubber used as well.

You as an Electrical Contractor can aid the War Effort by compliance with the above directives, the simplification of Wiring Construction and use of wiring products made of non-critical materials. Write today for our catalog and "Installation Manual on Porcelain Protected Wiring Systems."

"Porcelain Points the Way to New Wiring Progress."

PORCELAIN PRODUCTS, INC.

FINDLAY, OHIO

AMERICA...*Where Castles in the*

SOME day, no matter how long and hard the interim, the first transport load of victorious troops will head for home. Long before we see it, men crowded on its decks will watch a phenomenon no other shores present.

Tiny cubes and spires will appear upon the horizon. Slowly, they will rise and rise until they tower above the ship in the majestic symmetry of an American skyline.

► As our sons and brothers pour ashore, the post-war world will begin—whether we are ready for it or not.

It behooves us to be ready.

In a war, it's a good rule to produce weapons in fear of defeat, but also to produce peace plans in fear of victory . . . And when we plan for peace, let's see that our "Castles in the air have their feet on the ground."

We know our men will come home to a land of tall buildings, fertile fields and swift transportation. Those things were in being when they went away.

But our post-war world will depend upon how we *use* the tools at hand, not upon the mere fact that we have them.

We *could* embark upon a vast new expansion of industry, based upon new production techniques and the use of light metals, plastics, and electronics.

We *could* foster world-wide trade that would raise the living standard of all peoples to our own level.

If we *could*, why not do it?

► We'll muff the job unless we keep our air castles tied to the ground. We have the ability and the will, but we may not understand how jobs are made and civilization is spread.

If we hold on to the fact that art, science, political experiments, luxuries AND necessities *all* must have their foundations in healthy industry, we will be more careful about doing the things that will keep business healthy.

When we realize that business progress is the foundation of all improvement, our tax laws will stop confusing personal profit (salaries and dividends) with reinvested profit.

► Profit held for reinvestment is the SEED MONEY of business. It is the money a business saves from current operations to insure future growth.

Business will need billions of "Seed Money" dollars when the war is over. But, under the present tax law, they cannot save as they should for that rainy day.

You hear lots of talk about the jobs that will result from the transparent automobiles and the sky-sedans

Air have had their Feet on the Ground

that industry will build after the war, but not enough talk about the need for SEED MONEY to turn those hopes into realities.

The practical fact is that business cannot adjust itself to post-war production without "seed money."

▶ "Seed money" will pay for the research that must come before new and better post-war products can be built. It will pay for retooling when new models are produced. It will pay for the study of methods to get the lower costs that will make it possible for more people to buy. It will pay for setting up new distributors and dealers, and for hundreds of other activities that are involved in the *growth* of business.

The tax law should be adjusted to allow business to accumulate funds for these necessary tasks of post-war development.

Ask your Congressman to see that American business is given a chance to create jobs after the war, be revising the excess profits tax so as to leave the "seed money."

THE McGRAW-HILL NETWORK OF INDUSTRIAL COMMUNICATION

22 publications, which gather "war-news" from the "war-production-front" through a staff of 153 editors and 725 engineer-correspondents . . . More than 1,500,000 executives, designers, production men and distributors use the editorial and advertising pages of these magazines to exchange ideas on war-production problems.

McGRAW-HILL BOOKS

Publishers of technical, engineering and business books for colleges, schools, and for business and industrial use.

McGRAW-HILL

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THE McGRAW-HILL NETWORK OF INDUSTRIAL COMMUNICATION:

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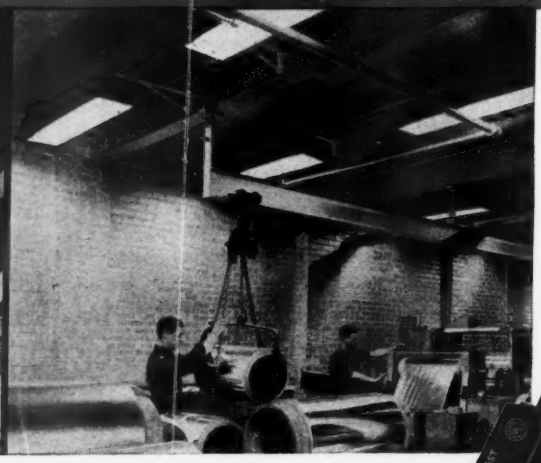
LIGHTING MUST NOT FAIL
WAR PRODUCTION CANNOT BE DELAYED



TRANSFORMERS FOR MERCURY LAMPS

For high bay lighting—for mercury lamps wherever used—Jefferson Electric ML Transformers insure maintained high efficiency of lamp performance. They are designed to govern the starting and operating cycles of this type of lighting unit.

BALLASTS FOR FLUORESCENT LAMPS

In thousands of war production plants and in every section of the country, Jefferson Electric Ballasts are proving their capability in long-hour service. They are made in single and two-lamp types, 15 to 100 watts; 3-lamp type for 40-watt lamps; 4-lamp type for 100-watt lamps.

CERTIFIED E-T-L SPEC NO 6 HIGH P.F.

POWER CIRCUIT TRANSFORMERS

save running separate lighting circuits throughout the plant. They can be mounted on machines to provide for close-up localized speed-up lighting—or at any point where 115-230 volt current is required for lights or small appliances.

WHETHER it's the general illumination by means of fluorescent lamps or high intensity mercury lamps,—or the close-up individual machine lamp,—failure in any case may cause serious delay in the flow of war machines or materiel to our fighting men. Since all production is geared together—stoppage or slowdown at one point affects all.

It is the concern of Jefferson Electric to provide maximum insurance against light failure with Ballasts and Transformers recognized for their dependability of performance. Discriminating production men, illumination engineers and electricians for years have specified Jefferson Electric Ballasts and Transformers and in today's program they play a more vital role than ever.

JEFFERSON ELECTRIC COMPANY
Bellwood, (Suburb of Chicago) Illinois
Canadian Factory: 60-64 Osler Avenue, W. Toronto, Ont.

JEFFERSON ELECTRIC

BALLASTS AND TRANSFORMERS

UMI

Mining—Number One War Industry

The mineral products of the earth are the prime necessities of war... and peace

THE SURFACE of the earth provided primitive man with the things he needed for his meager existence but civilization really began when he became curious about its interior. This curiosity has brought us a long way. For the earth has yielded — out of its deep recesses — all the raw materials of modern industry. And today, in the grueling race of production, our mining industry is providing the raw materials upon which depends our survival. Our mines and quarries must supply a long list of materials without which a successful war cannot be fought.

Take steel, for example. War without steel is inconceivable. Steel starts with iron ore, limestone and coke. These are products of mines and quarries. It takes power and heat to get these materials out of the ground, to refine them and to transport them to the point where processing begins. All the subsequent operations culminating in the steel ingot, shape or plate, and in moving the final product to the point of use require power and heat.

The major source of this power and heat is coal.

Production of a ton of steel, it has been stated, requires two tons of coal. Smelting of the pig iron alone, 60,000,000 tons in 1942, required the coking of some 75,000,000 tons of coal. Pig output is expected to rise to 68,000,000-70,000,000 tons in 1943, carrying coal consumption up to 85,000,000 tons. At the same time, output of steel ingots is expected to rise from 87,000,000 to 97,000,000 tons. Think what this means in terms of power and heat.

Another vital metal is copper. Modern armies need copper. This point is dramatically illustrated in a recent memorandum by Robert P. Patterson, Under Secretary of War, in announcing the release of 4,000 men from military service to return to the mines and increase copper production. "In a single minute of combat", Mr. Patterson declared, "a flight of 50 fighter planes shoots away 7 tons of copper. A 37-mm. anti-aircraft gun uses up a ton of copper every twenty minutes it is in operation. Six hundred pounds of copper go into every medium tank, and a ton into the engines and airframe of a Flying Fortress. The Signal Corps alone needs 5,000 tons of copper every month for radio and telegraphic and telephonic equipment. An army without copper would be an army without speed, maneuverability or firepower. It would not last a day in battle".

Seven tons of copper for one minute of combat by 50 fighter planes means from 200 to 700 tons of ore, depending upon its grade. Small wonder that the War Department was willing to release drafted miners from military duties to produce more copper.

But other metals are equally important in war: tungsten, nickel, manganese, chromium, vanadium and molybdenum for alloy steels; zinc for brass and die castings; tin for bronze and bearings; aluminum and magnesium for aircraft; lead and mercury for ammunition; silver for electrical equipment, bearings and solder, and so on. Even relatively insignificant non-metallics, like mica and diamonds, suddenly assume critical importance.

And let us not lose sight of the fact that without adequate energy, i.e., heat and power, production, processing, transportation and the relative comforts to which we have become accustomed would be impossible under war conditions. Coal is the major source of energy in the United States. It supplies more than half the total in normal years.

The railroads of the country alone used 110,000,000 tons in 1942 to move freight and passengers and service their facilities. Utilities consumed over 68,000,000 tons in the production of electric power. Over 135,000,000 tons of coal were consumed last year in maintaining the level of heating comfort necessary for the maintenance of efficiency and morale. The consumption, this year, will be even greater.

In short, the mineral products of the earth are the prime necessities of war.

The nations that control the world's mineral resources and make the most efficient use of them will win the victory.

Before the war, the British Empire and the United States together controlled probably 75 per cent of the world's mineral production. This would have been a most potent weapon in the United Nations' arsenal if the whole strategy of Axis expansion had not been influenced by mineral objectives. Addressing the American Zinc Institute on the subject last April, E. W. Pehrson, of the U. S. Bureau of Mines, estimated that the Axis had improved its position in world mineral resources in the following percentages: iron ore, from 6 to 46; steel production capacity, 20 to 34; petroleum, 1 to 7; coal, 27 to 53; copper, 5 to 10; lead, 7 to 22; zinc, 16 to 27; tin, 1 to 72; manganese, 2 to 30; chrome, 3 to 30; tungsten, 6 to 60. In the light metals, areas now Axis-controlled produced in 1940 54 per cent of the world's aluminum, 49 per cent of the bauxite (the principal source of aluminum) and two-thirds of the magnesium.

This is the eighth of a series of editorials appearing monthly in all McGraw-Hill publications, reaching more than one and one-half million readers, and in daily newspapers in New York, Chicago and Washington, D. C. They are dedicated to the purpose of telling the part that each industry is playing in the war effort and of informing the public on the magnificent war-production accomplishments of America's industries.

Despite these gains, the industrial war power of the United Nations still can outweigh that of the Axis by a considerable margin. It already has begun to surpass it. The problem is to convert quickly our potential mineral resources into implements of war. In this conversion, a heavy burden of responsibility has been placed on the mining industry of the United States as the largest producer of many metals, minerals and fuels. In fact, the United States mining industry began to go on a war basis a year before Pearl Harbor. The curves of demand for domestic copper, lead, zinc and other metals began to rise sharply in 1940, and were paralleled by a rising coal production.

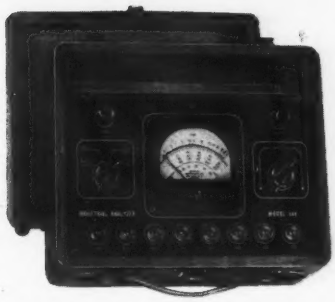
How well the job has been done cannot be revealed in accurate figures in many cases because of censorship. In metals, however, some idea of production gains can be indicated in comparative terms. United States copper production, for example, is breaking all previous records. Aluminum capacity will be more than seven times its annual peace-time average. Magnesium plants now building will have a capacity 100 times the largest yearly before-the-war figure. Molybdenum, of which the United States has the largest single mine in the world, is being made available in record quantity. Zinc, lead and mercury are surpassing expectations in meeting wartime demands, and tungsten, chromium, manganese, antimony and iron and steel are being turned out in record-breaking quantities.

Bituminous coal production in 1942 was 580,000,000 tons, the greatest in history, valued at more than $1,300,000,000 at the mine. Some 430,000 or more men were employed in 1942 and received at least $750,000,000 in wages. Bituminous production in 1939 was 394,855,000 tons, while the output for 1943 is forecast at approximately 600,000,000 tons – another new United States record. The 1942 anthracite output was 59,961,000 tons, valued at over $270,000,000 at the mine. The industry employed some 85,000 men and paid out at least $180,000,000 in wages. The 1939 production of anthracite was 51,487,000 tons, and the forecast for 1943 is 65,000,000 tons or more.

Marshalling the Western Hemisphere's mineral resources, the United Nations have been the beneficiaries of the diversified resources of two continents – in particular of Canada's nickel and coal, Mexico's lead and antimony, Chile's copper, Bolivia's tin, Peru's vanadium, Brazil's iron, and Venezuela's petroleum. With other United Nations contributing their share of metals and fuel, the grand total is an impressive array of potential munitions and matériel to lend assurance of certain victory over the Axis. Sheer weight of metal, properly used, will win the war, and our mineral industry will have played an indispensable and essential part in the inevitable outcome.

President, McGraw-Hill Publishing Company, Inc.

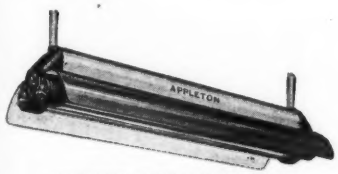
EQUIPMENT News



SUPERIOR INDUSTRIAL ANALYZER

Fluorescent Unit

This explosion-proof fluorescent unit complies with the requirements for Class I, Group D and Class II, Group G hazardous locations. The construction eliminates the need for sealing fittings and accessories. A terminal block is provided to make line connections. All factory connections are made to the same block, eliminating splices. Easy accessibility to lamps, starters and ballast makes replacement a simple operation. The reflector is non-metallic with baked white enamel finish. Fixture is furnished with two 48-inch T-12, (40 watt) lamps. They operate on 110-120 volt, 60 cycle and 220-250 volt. Appleton Electric Company, 1701 Wellington Avenue, Chicago, Ill.



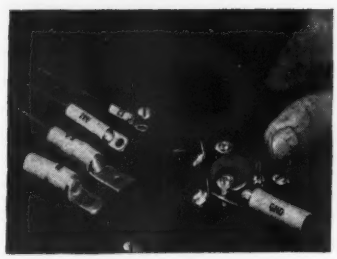
APPLETON FLUORESCENT UNIT

■

Instrument

The Model C hand tachometer is the single range type. It has an etched metal dial, shock proof case, thrust bearing, uniform graduation and is unaffected by changes in temperature. It operates in any position, independent of direction of shaft rotation. It is 3½-in. in diameter and 2 7/16-in. deep, and supplied with the following accessories: 1 triangular steel tip; 1 conical rubber tip, metal mounted; 1 pointed rubber tip, metal mounted; and 1 six inch circumference wheel disc for measuring feet per minute. Herman H. Sticht Company, Inc., 27 Park Place, New York, N. Y.

STICHT INSTRUMENT



IRVINGTON INSULATOR AND WIRE MARKER

Insulator and Wire Marker

These short lengths of extruded plastic tubing serve as insulators of terminal connections and as wire markers. Where lug insulation and wire identification are required, they speed assembly by eliminating any additional means of identification. The tubing has very high dielectric strength. Available in colored tubing with either black or yellow symbols, in A.S.T.M. sizes from No. 9 up to ⅝-in. I.D. Smooth inside surfaces permit quick application over wires and lugs. Legible numerals of customer's choice are printed on tubing with an ink that has resistance to chemicals, water and oils equal to that of the tubing itself. Irvington Varnish & Insulator Company, 6 Argyle Terrace, Irvington, N. J.

■

HART RELAY

Relay

A new solenoid type 25 amp. aircraft relay has been announced. Unit is built to conform to U. S. Army Air Corps specifications (type B-2A) and features a rigid cap which protects relay from dust. The cap also reduces the danger of mechanical damage with consequently lessened chance of failure. The new 25 amp. unit supplements this line of aircraft relays. Hart Manufacturing Company, Hartford, Conn.

Instrument

This industrial analyzer provides all the measuring services required for maintenance, development, testing and laboratory work. It measures a.c. up to 30 amperes; a.c. and d.c. voltages up to 1500 volts and resistances up to 2500 ohms. It is portable and no external source of current is required. The same voltage scale is used for both a.c. and d.c. voltage measurements. Separate tip jacks for each individual range eliminates possibility of overloading and burning out the meter by improper switching. The dimensions are 8½- by 7- by 4½-inches. Superior Instruments Co., 227 Fulton St., New York, N. Y.

■

Motor Starter

A new thermaload V solenoid motor starter has been announced. Its small size, 5¾- by 5¼- by 4½-in. permits installation in small places. Its features include the Monitor bi-metal compensated overload relay. It permits perfect starter operation under extremes of ambient temperature. Full overload protection is assured because the trip always occurs within the same time at a given percentage of overload. The operator must press the button and release it before contact is made. Other features include vertical, straight-line design; resilient, shock-proof mounting; double-break contacts of silver; coils that are interchangeable for different voltages. Available in five sizes—1.5 to 7.5 hp. and 110 to 550 volts, a.c. Monitor Controller Company, 51 S. Gay Street, Baltimore, Md.

MONITOR SOLENOID MOTOR STARTER

UMI

THAT THERE SHALL ALWAYS BE LIGHT

On the production front all over the country men are hard at work making guns, planes, ships and tanks. Tools for Victory. And Federalite NTPR panelboards are hard at work, too, giving perfect control and protection of lighting and small power circuits.

Panelboards alone, like any single factor taken by itself, won't win the war. But anything that helps speed up output and improve quality—anything that helps get the job done better and faster—*helps* win the war. That's just what Federalite NTPR panelboards are doing.

These rugged, precision-made Federalite NTPR panelboards are built for service. Steady and dependable, they offer many advantages—switch ahead of every fuse gives higher safety factor . . . floating contacts . . . frictionless snap-action mechanism . . . solderless lugs in mains and branches . . . giant, easy-grip switch handles . . . shallow depth for mounting in thin walls . . . large wiring gutters . . . *low cost.* These are but a few of the reasons why Federalite NTPR panelboards are being installed in greater number today than ever before.

The men who know—the men who supply and install electrical equipment—the electrical wholesalers and contractors with difficult war jobs to tackle . . . industrial conversions . . . army camp, navy base and industrial installations . . . defense housing projects—are switching to Federal.

They know these Federalite NTPR panelboards assure a steady flow of power for lighting and small power circuits and protect the lights by which men work to keep supplies flowing to our fighting fronts. *For complete information about these low cost Federalite panelboards write for catalog 42.*

Federal

FEDERAL ELECTRIC PRODUCTS COMPANY

48 Paris St., Newark, N. J.

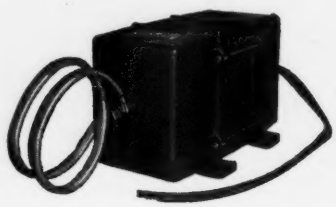
SAFETY SWITCHES • SWITCHBOARDS
PANELBOARDS • CIRCUIT BREAKERS

EQUIPMENT News

[FROM PAGE 85]

Isolating Transformer

Type T-4173 isolating transformer makes use of a secondary completely enclosed in a copper shield. Secondary terminal connections are provided by means of a lead shielded cable, the sheath of which is integrally joined to the copper enclosing shield of the secondary winding. Rated at 2 kva. it is capable of handling an overload of 50 per cent. The regulation of the transformer is one per cent at 1 kva. The use of instruments or equipment may be used as the need requires, the load being switched on and off without affecting the relatively constant voltage necessary for accurate testing. Acme Electric & Mfg. Co., Cuba, New York.

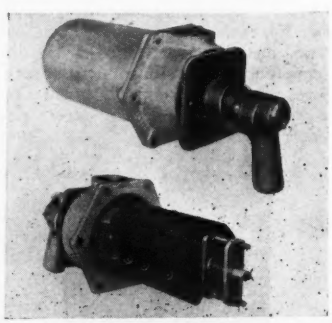


ACME ISOLATING TRANSFORMER

■

Control Switch

This heavy duty immersion proof control, instrument or transfer switch is rated 20 amperes, 600 volt, a.c. with four circuit control. Turning handle to right or left closes a circuit; pushing in handle opens third circuit and pulling out handle opens fourth. A spring return restores to normal conditions by releasing handle after operation. Locking features in the handle design permit locking in either the normal or pushed in position. Delta-Star Electric Company, 2400 Block, Fulton St., Chicago, Illinois.



DELTA-STAR CONTROL SWITCH

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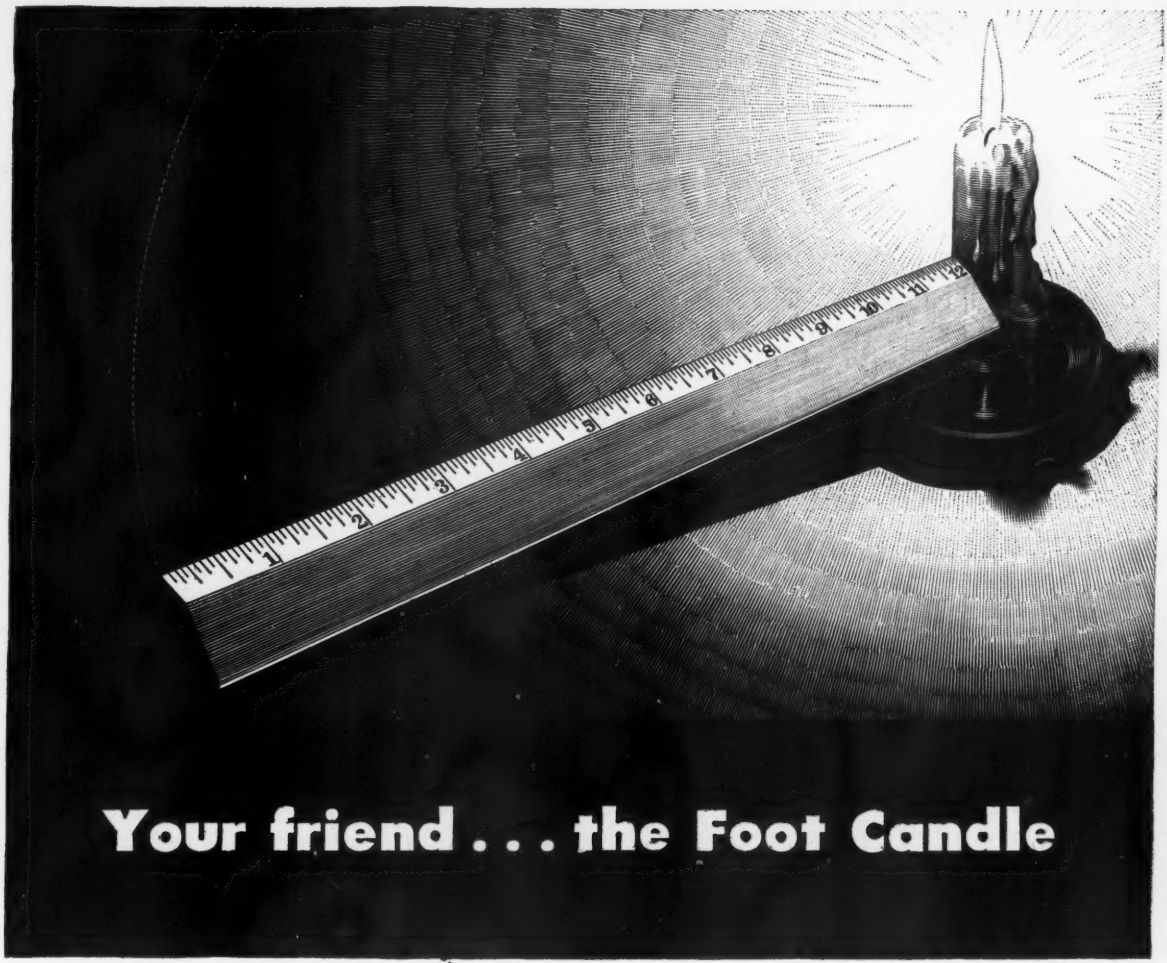


Your friend . . . the Foot Candle

A foot candle is the illumination from one standard candle on a surface one foot from the light source.

It is the unit of measurement of illumination.

But more than this, the foot candle is man's staunch friend.

In adequate amounts it means his family will have sufficient light in the home . . . he and his fellow workers sufficient light for better, safer factory production or efficient office detail.

For almost 100 years the MILLER organization has known the foot candle on working terms. This lighting experience bridges the broad ground from the whale oil lamp to the modern continuous fluorescent lighting system now helping industry speed out planes and tanks and cannon.

It has involved engineering and design and skill with copper . . . glass . . . steel . . . aluminum and many new non-metallic materials. It has required ingenuity and resourcefulness and pioneering.

It qualifies us to work with those who need better lighting in war industry. It enables us to cooperate intelligently with those who promote better lighting and sell and service it, too. It means that the MILLER engineer (located in principal cities) can serve you in one of several ways, for better lighting today and tomorrow.

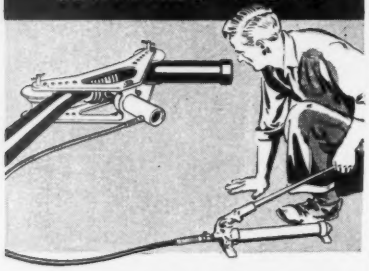
Miller Lighting

. . . for better, safer production
. . . for a more prosperous peace

THE MILLER COMPANY • MERIDEN, CONN.

Today our men and women are also busy making gauges, bomb noses, torpedo and searchlight parts, wiring devices, ship fixtures and many other precision parts for Army & Navy!

JUST THE "TICKET" for Speeding Up Wartime Work

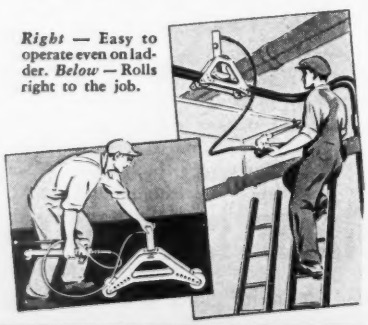


Low-Cost BLACKHAWK Pipe Bender has EVERYTHING!

- COMPACT
- PORTABLE
- ONE-MAN OPERATION
- ON-THE-JOB ACTION
- BENDS PIPE AND RIGID CONDUIT FROM 1" TO 4"

You bet! — and Blackhawk Hydraulic Pipe Benders operate at any angle — avoid kinking, save need for heating or cutting and threading and use of elbows and couplings. Compact 10 or 20-ton ram and big range of attachments also handle many other bend, straighten, press, push, pull, spread and clamp jobs.

Right — Easy to operate even on ladder. *Below* — Rolls right to the job.



MAIL COUPON TODAY

BLACKHAWK MFG. COMPANY
Dept. P2023, Milwaukee, Wis.

Send full information about your Pipe Benders.

Name.....

Company.....

Address.....

Tax Saving Opportunities

[FROM PAGE 28]

tion with the earning of taxable income may be deducted from now on. Nonbusiness debts must be totally worthless before deductions and then are subject to capital loss limitations. Ordinary business debts may be deducted wholly or in part if the contractor can prove, with a reasonable degree of certainty, the amount thereof, which is uncollectible. Medical expenses exceeding five per cent of net income are deductible up to $2,500. Note that the sum you can deduct is only the *excess* over five per cent of net income.

In previous years, if you deducted bad debts in a loss-year, not getting a tax benefit thereby, you had to pay a tax on any recoveries in a subsequent year. The 1942 bill corrects this inconsistency by permitting the exclusion from gross income of subsequent recoveries on bad debts written off in loss-years providing that these deductions did not, in themselves, create a tax benefit in the form of a net operating loss carry-over. This amendment does not apply to those contractors using the reserve method of writing off bad debts. If you charged off bad debts in a profit-year, this means you took credit for the deduction so you must include any recoveries in subsequent years as income and pay a tax thereon.

Maintenance Costs

Maintenance and repairs offer a tax deduction in normal times but due to the difficulties getting materials and manpower to provide adequate upkeep today, the contractor may have to forego part or all of this expense for the duration. This will produce a bigger profit on paper and a tax must be paid on the differential even though the profit is "watered" by the inability to take a deduction for normal upkeep. Contractors have queried us about this apparent inequality, contending that depreciation goes on in war and peace and if repairs are neglected when needed, they gang up and take a relatively bigger toll sooner or later or compel premature replacement. We want to point out that the carry-back provision takes care of this, otherwise, taxpayers owning buildings and equipment used on income-producing activities, would have to pay higher taxes for the duration and then, when they eventually had to make the cumulative repairs in the postwar period, the expense might be so great that operations for the year of reconditioning showed a loss with no tax benefit. Now, you can carry back such a loss to the two preceding years.

Taxpayers have often paid excessive taxes because they capitalized repairs and maintenance. Repairs that keep an income-producing property in ordinary efficient operating condition are an expense. There are borderline cases of this type, which may be considered an increase in capital or an expense. Be conservative in capitalizing such items, where logical argument will support them as expenses. This keeps down the tax.

Pearl Harbor added another amendment. War losses sustained since December 7, 1941 because of the seizure or destruction of property attending military or naval operations are deductible. Taxpayers who have covered their properties with war risk insurance cannot deduct this loss if the insurance company makes good the claim. Only a business loss not covered by insurance is deductible.

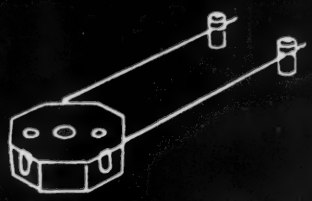
Victory Tax

The Victory tax deduction of five per cent from the pay envelopes of employees earning more than $624 yearly went into effect on January 1, 1943. Be sure you record deductions carefully. We suggest that you buy a bound book for about 50 cents and label it "Victory Tax Deductions from Payroll". This tax belongs to the government, you are the trustee. Remit quarterly as with social security, but disaster may follow if you treat this tax as a periodic expense, as some have considered social security remittances in the past, because this tax is five times greater. An individual carrying on a business will consider the Victory Tax net income as the gross income less expenses connected with business or non-business enterprises used to produce income.

It is recognized, but not determinable, that at one point taxes become a brake on enterprise because management is dulled, extravagance and inefficiency encouraged. Although that point is not readily discernible, the contractor has one means of keeping that borderline as far away as possible. His taxable base should represent his true net income. High rates are justified to win the war but not the taxing of artificial income. The contractor must see that his income, as reported, takes advantage of all legitimate deductions. When income rates were low, it caused less financial havoc to pass up deductions. Today, every dollar deducted means a much bigger saving so take all you can get legitimately.

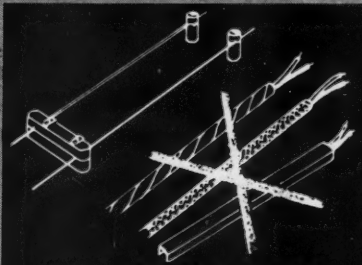
[Continued on Page 90]

UMI



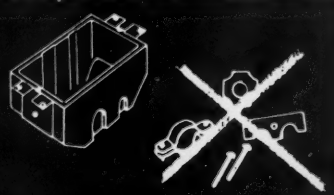
Only Porcelain Protected Knob and Tube Wiring offers conductor separation, rapid heat dissipation, maximum safety, economy, and superior carrying capacity.

Porcelain Protected Cable Wiring also provides safe, dependable insulation.

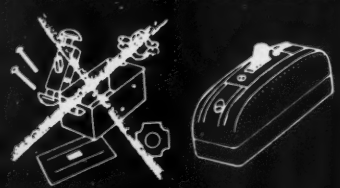


Low cost Rubber Insulated Wires supported on Porcelain Knobs, Tubes, and Cleats instead of expensive cables or raceways.

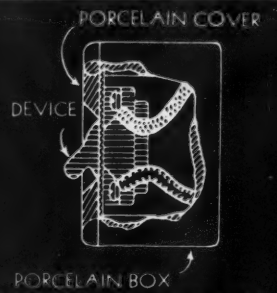
USE PORCELAIN PROTECTED WIRING SYSTEMS *for* MODERN, DURABLE, ECONOMICAL WIRING AND FULLY MEET TODAY'S *Government Wartime Specifications*



Porcelain Outlet Boxes require no cable clamps, connectors, miscellaneous screws or locknuts—they provide full insulation at the outlet where it is needed most.



Surface Wiring Systems eliminate the cost of metal boxes and accessories.



Only porcelain protected wiring provides a completely insulated outlet.

None of the restrictions imposed on the use of wiring materials affect porcelain—it is not a critical material. It is available for today's wiring jobs. These systems are fire proof—rust proof—corrosion proof—short proof—shock proof.

For years the features which have made this system so popular are SAFETY which has been developed to the highest degree, the elimination of extraneous and unessential conducting materials necessary in some locations for mechanical protection only, and an Economical Liberal Adequacy for residential, commercial, industrial institutional buildings and rural installation. These features have been achieved through the use of all porcelain outlets, conductor supports, and the use of dry air as an insulating medium and heat dissipator.

You can meet all of your immediate installation jobs now with the knowledge that you will get the most modern results and assure future dependability by using PORCELAIN. Your wholesaler can supply you. The companies listed below manufacture modern porcelain protected wiring systems.

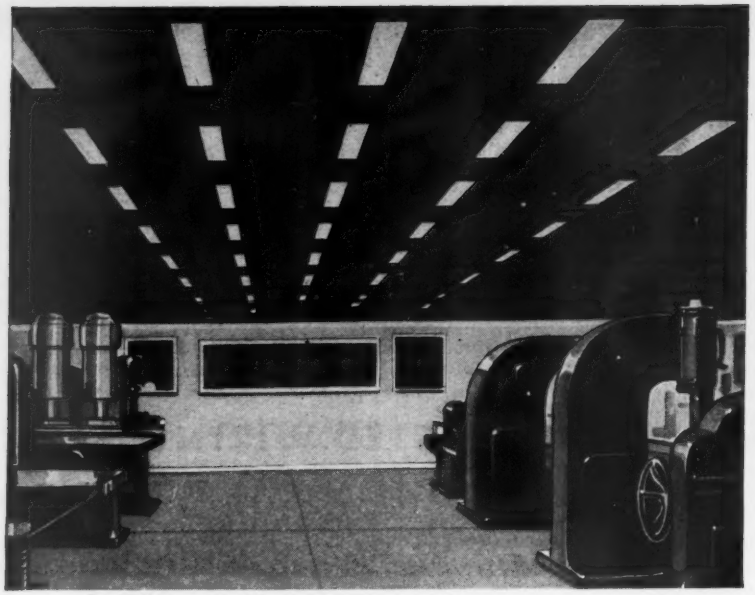
MODERN PORCELAIN PROTECTED WIRING SYSTEMS

★ ILLINOIS ELECTRIC PORCELAIN CO.
Macomb, Ill.

★ KNOX PORCELAIN CORPORATION
Knoxville, Tennessee

★ PORCELAIN PRODUCTS, INCORPORATED
Findlay, Ohio

UMI



Lamp Insurance?

Yes, Sir, you can insure longer lamp life with G-E Starters because they give—

CONTROLLED STARTING

Controlled starting means the starter lights the lamp at the precisely right moment—not before, not after. This cuts to a minimum the amount of emission material used. And it is the excessive use of this material that shortens lamp life.

"MASTER NO BLINK" STARTER

Here's the starter that's recognized as an outstanding contribution to better fluorescent lighting.

It is a manual reset starter that completely eliminates blinking and flickering, and saves you power, maintenance time and war vital materials.

This new G-E Starter instantly cuts out a dead lamp from the circuit. No current is used to keep the lamp locked out. No current is wasted trying to restart the dead lamp. No wasteful wear and tear is placed on the starter and ballast—all of which means a saving in current and vital materials.

THE WHOLE STORY'S IN THIS FOLDER

The full line of G-E Accessories and their proper use for best fluorescent lighting may be had by writing to General Electric Co., Section G233-8, Appliance and Merchandise Dept., Bridgeport, Connecticut.

GENERAL ELECTRIC

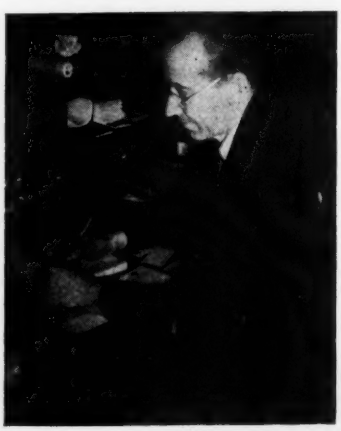
Tax Saving Opportunities

[FROM PAGE 88]

The tax-saving opportunities are put in the law for you to benefit by them.

Finally, bear in mind when listing deductions that accounting, unlike mathematics, is not an exact science. In most business transactions, there is only one right way, but in certain borderline cases, recording depends upon the viewpoint of the management and this may differ in different establishments. When a transaction may be interpreted in two different ways with equal propriety, use the interpretation in your favor. This is not tax evasion. It is tax avoidance. There is a big difference. The Supreme Court has ruled that, "The legal right of the taxpayer to decrease the amount of what otherwise would be his taxes or altogether avoid them, by means which the law permits, cannot be doubted. It is well settled that a taxpayer may resort to any legal methods available to him to depreciate the amount of his tax liability, so long as his efforts are confined to law."

Many income tax laws can be interpreted in more ways than one. The Treasury Department may impose a tax on one taxpayer under one interpretation and tax another under a different application or analysis of the law. There is no willful evasion if there is no concealment of material facts. There are lawful means of reducing the tax and there is no stigma attached to the taxpayer who follows the tax laws, yet, tries to keep his tax expense down to minimum.



WILLIAM BRUNIA, Brunia Electric Co., Des Moines, Ia., electrical contractor and motor repair shop, caters to REA customers. Keeping the farms in operating condition is also a very important phase of our war program.

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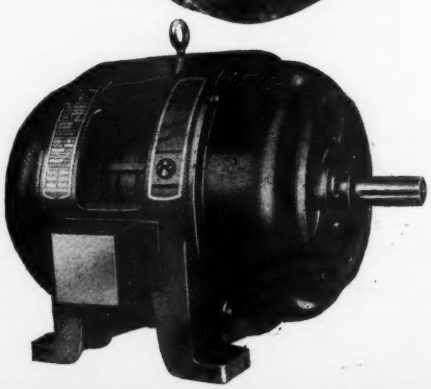
When You Can't Buy 'em *BIG*—Buy 'em *GOOD!*



REALLY, it's no hardship when you have to buy smaller motors. *You save money.* But remember, when you can't buy 'em big—buy 'em good.

Now that you cannot depend on oversize to take your motors through tough service—you must depend on quality.

That is why you should investigate Fairbanks-Morse Motors with *Copperspun* Rotors.

The winding of the *Copperspun* Rotor is centrifugally cast of COPPER in one piece. It provides electrical and thermal characteristics that give this motor the stamina to stand up under the most severe service without mechanical failure. You can operate a Fairbanks-Morse Motor with *Copperspun* Rotor at its full rated capacity continuously and indefinitely without fear of damage from overloading.

Fairbanks, Morse & Co., 600 S. Michigan Ave., Chicago, Ill.

Copperspun

FAIRBANKS-MORSE

DIESEL ENGINES
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F M

Motors

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In the News

HOW MPR 136 APPLIES TO CONTRACTORS EXPLAINED

An interpretation of how MPR 136 applies to electrical contractors since MPR 251 was issued, is explained in an official OPA statement. The new construction regulation takes precedence in ordinary lump sum contracts involving installation. MPR 136 must be observed, however, for materials under T & M contracts or any other arrangement where materials or equipment are billed separately from installation charges. True "cost-plus", where costs include no margin, are not covered by MPR 136, however, a contractor must file a report of such a contract under Section 1390.14.

The complete interpretation is as follows:

MAXIMUM PRICE REGULATION 136. Machines and Parts, and Machinery Services *Applicability—electrical contractors.* The following interpretations have been made as to the applicability of the Regulation to electrical contractors:

(1) Equipment or material listed in Appendix A or Appendix B which is sold by a contractor at a retail price to an ultimate consumer, whether made inside or outside his shop or place of business, is exempt from the Regulation; the General Maximum Price Regulation applies to sales of such equipment or material, except as to sales of building and industrial equipment and materials on an installed or erected basis which are covered by Maximum Price Regulation No. 251 (Construction and Maintenance Services and Sales of Building and Industrial Equipment and Materials on an Installed or Erected Basis).

(2) Sales of material or equipment covered by the Regulation when made by a contractor to an industrial, commercial or governmental user, whether made inside or outside his shop or place of business, are subject to the regulation, unless such sales involve items usually sold to private consumers, such as householders, and are made at the retail prices which would be used in making sales to that class of purchasers. In the latter case the General Maximum Price Regulation applies except that sales of building and industrial equipment and materials on an installed or erected basis, within the meaning of Regulation No. 251, are subject to the Regulation.

(3) The Regulation applies to the sale of material and equipment covered by Appendix A or B involved in contract work of the contractor, where the contract is on the basis of: (a) material, labor and services, or (b) time and material, or (c) any other basis where payment is separately made for materials or equipment, except (d) a true "cost-plus" basis, which includes only those contracts in which a flat fee or percentage is added to actual costs, i.e., costs which include no element of profit, or margin of overhead, or other mark-up or addition.

(4) Although strict cost-plus contracts are excluded from the Regulation, as explained above, a contractor entering into such a contract involving sales of equipment or material covered by the Regulation must file a report thereof under Section 1390.14 (Reports on Cost-Plus Contracts).

(5) Compensation which a contractor receives solely for his service in making installations of material and equipment covered by the Regulation are specifically excluded from the Regulation by Section 1390.10 (f); compensation for such services is controlled by Regulation No. 251, except for that portion covered by Regulation No. 165 (Services) concerning the contractor's services principally as they relate to repair and maintenance of household, retail establishment and institutional equipment. In calculating maximum charges under Regulation No. 251, materials and equipment covered by Regulation No. 136 go in at maximum prices as determined under Regulation No. 136.

(6) A contractor's work in repairing, rebuilding, maintaining or performing any of the other acts defined as "machinery services" by the Regulation, upon any material or equipment covered thereby, is included in the Regulation. If the contractor's work is not within the coverage of Regulation No. 136, Regulation No. 251 or Regulation No. 165 applies to such services.

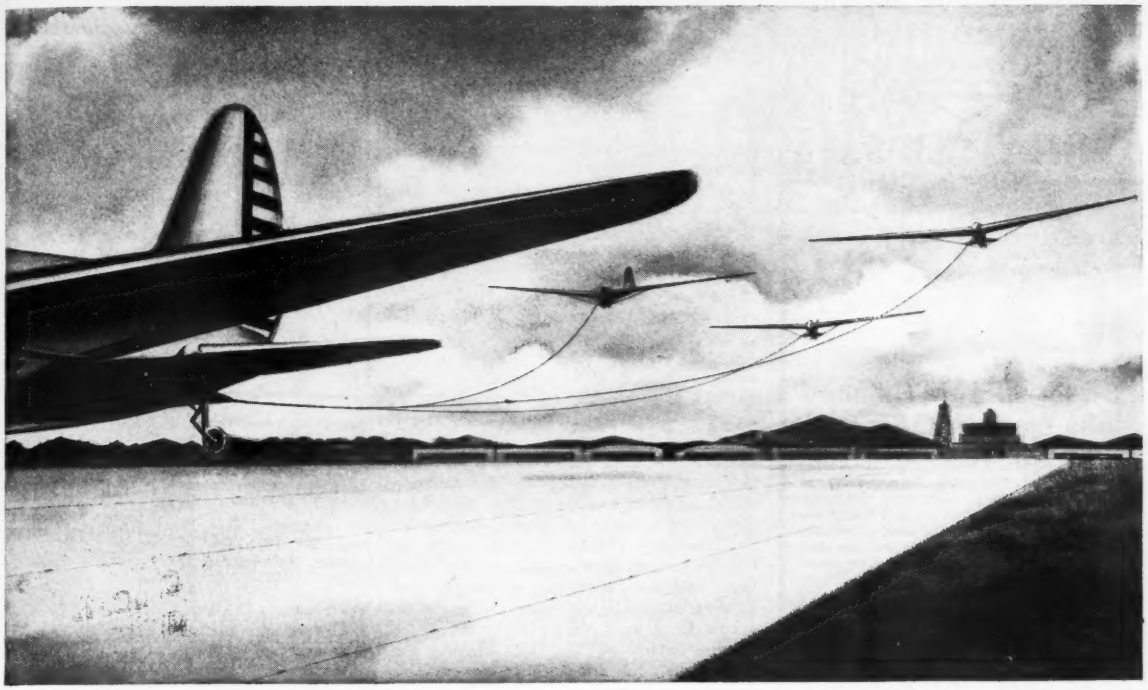
(7) To the extent that a contractor's sales of material include wire, cable and cable accessories, as defined by Price Schedule No. 82 (Wire, Cable and cable Accessories) such sales are covered by that Schedule.

NEW ORLEANS GROUP ELECTS

J. Otto Kaelin is the new president of the Electrical Association of New Orleans. Other officers elected to serve with Mr. Kaelin during the 1943 term include executive vice-president C. L. Osterberger and

"I wish they wouldn't camouflage these war plants until we're finished wiring them!"

ONLY AN ELECTRICAL WHOLESALER COULD THUS SPEED WAR PRODUCTION



WESCO helped gliders fly 5 weeks earlier

Delivered Materials Complete in 19 Days; Huge Plant Met Government Deadline

In the granary of America a glider plant was ordered built; time limit for completion 30 days. On the 20th of the month the nearest Wesco House received the large order for panelboards, transformers, fluorescent lighting, power cable and potheads. The job was awarded because of Wesco's reputation for fast delivery and follow-through service.

Wesco placed all orders the same day and suppliers the country over sprang into action. In less than a week trucks rolled up and began unloading at the site. In 19 days every item ordered from Wesco was on the job as compared with 7 weeks best possible delivery from manufacturers. The plant was completed and in production on the 30th day.

This Wesco performance, and scores like it, don't just happen. They are the result of years of training, experience and individual ability. Wesco service has enlisted "for the duration". After Victory it will again speed the development of business.

WESCO SPEEDS PRODUCTION

* A Marine air base needed delivery of hundreds of electrical items next morning. Five Wesco Houses pooled stocks and met the deadline.
* Lack of a critical product threatened to tie-up a war chemical plant. The manufacturer promised delivery in 60 days. Wesco delivered in 24 hrs.!

WESCO SERVES BUSINESS

* By warehousing stocks in anticipation of customers' needs.
* By providing engineering service in making up lists of materials and in preparing bids on jobs.
* By buying large quantities at low prices and passing the savings on to small-quantity buyers.

Westinghouse Electric Supply Co.

150 VARICK STREET • • • NEW YORK, N.Y.

A NATIONAL DISTRIBUTING ORGANIZATION WITH 80 BRANCHES

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JIFFY CLIPS..

One Hole Pipe Clamp

Good reliable finished jobs mean MORE jobs for you The Minerallac Jiffy Clip of Cadmium Plated Steel or Everdur is a strong, substantial clamp for hanging pipe and conduit, and BX cable. Only one screw or bolt is needed to hold the clip and its load in place securely and firmly. Ribs drawn in the clip allow great strength without bulk or weight. Use them on your next job and you'll keep on using them. See your jobber or write us direct.

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TIME SWITCHES

TRIPLE POLE
DOUBLE POLE
SINGLE POLE

All three types can be furnished with capacities ranging from 20 TO 200 AMPERES PER POLE, listing from $16.50 up. Ten ampere Time Switches from $3.95 up.

PROCESS TIMERS

INTERVAL TIMERS, or PROCESS TIMERS, are furnished in two types. One is reset by hand (manual); other resets itself, automatically. Both types can be provided for practically any cycle of time, fully adjustable from zero to maximum period. SYNCHRONOUS, SELF-STARTING MOTORS.

SIGNAL TIMERS

Used extensively for starting and stopping industrial work; school class periods; for municipal time signals, etc. Up to six signal periods, permanently set at factory with Sunday & Holiday Cutout and Manual Control, at a list price of only $35.

Write for Information

AUTOMATIC ELECTRIC MFG. CO.

MANKATO, MINNESOTA

In the News

[FROM PAGE 92]

the following vice-presidents of various divisions: Wholesalers, Utilities, Manufacturers—R. M. Salvant; Electrical Contractors—R. C. Pflueger; Air Conditioning, Ventilating—J. N. Roos; Radio—J. W. Schroeder. J. R. Guidroz is secretary; I. W. Tufts, treasurer; and W. E. Clemont, director of publicity.

Members of the Executive Committee include: R. Viener, W. B. Meek, E. N. Avegno, W. B. Wands, J. P. Maguire, Frank Paeske, A. B. Lindauer, Fred Stockton and A. J. McCall, ex-officio member.

After reviewing the past activities of the association, retiring president A. J. McCall suggested the institution of a General Planning Committee to guide future association plans and the appointment of a War-Time Committee to study and develop a program on "Industry Problems"—better lighting for defense, production and against sabotage, and for complete maintenance of existing electrical appliances.

Leo L. Hirsch, first president of the League, welcomed Mr. McCall into the President's Club after he had received his certificate of membership from new president Kaelin.

COOK COUNTY GROUP ELECTS

E. H. Wigdahl, Wigdahl Electric Co., was reelected president of the Cook County Electrical Contractors Association, Chicago at the annual balloting meeting of that organization. Other officers who emerged victorious on the 1943 slate include: Vice-president, T. L. Hankins, Condo Electric Co.; secretary, Emil DeHaan, Service Electric Shop; treasurer, Henry Bell, Commodore Electric Company.

Directors chosen for 1943 are Frank Block, Block Electric Co.; J. A. Kelley, Rainbow Electric Co.; Joseph Kunst, Principle Electric Co.; Alvin Oppenheimer, A. Oppenheimer, Inc.; George W. Reinke, Geo. W. Reinke Electric Co.; Wm. J. Templeman, Premier Electric Construction Co.; and Joseph Turek, Avers Electric Company. The new officers took on their official duties at the installation meeting on January 18.

CHICAGO LEARNS ABOUT INFRA-RED

The story of near infra-red, the electrical heat that chops hours from baking, drying, pre-heating and dehydration processes, was dramatically presented at a 3-day conference, Dec. 28-30, at the LaSalle Hotel, Chicago.

Sponsored by the Fostoria Pressed Steel Corporation and their Chicago industrial service representative, Hyre Electric Company, the sessions included a series of lec-

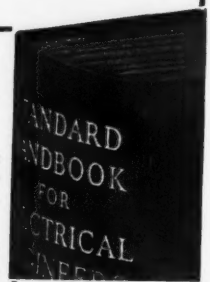
102 engineers and scientists make the

STANDARD HANDBOOK for ELECTRICAL ENGINEERS

dependable and practical for you

Archer E. Knowlton, Editor-in-Chief
Associate Editor for Engineering, Electrical World

7th Edition, 2303 pages 6x9, 1700 illustrations, 600 tables, $8.00



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- every section fully revised
- whole new sections; actually hundreds of pages of new material
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HERE is the great standard reference work of all in the electrical engineering profession or whose work in industry or engineering touches on this field. Its 2303 pages present a handy - reference compilation of practical, usable data from all fields of electrical engineering practice, plus the most frequently required fundamental theory, units, and systems of measurement, made dependable by the work of more than 100 engineers, scientists, teachers, and other authorities.

Thousands of useful facts in these

26 BIG SECTIONS

Units and Conversion Factors
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Prime Movers
Power Plant Economics
Power System Electrical Equipment
Power Transmission
Power Distribution
Wiring Design—Commercial and industrial Buildings
Illumination
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Send me the Standard Handbook for Electrical Engineers, 7th Edition, for 10 days' examination on approval. In 10 days I will send $8.00, plus few cents postage, or return book postpaid. (We pay postage if you remit with order.)

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FOR BAKING—DRYING DEHYDRATING OR PREHEATING OPERATIONS

Infra-red

On the war production front, today, industry has found amazing advantages in the employment of the Near Infra-red Process. Its sensationally faster speed than other forms of heat transfer — its space and material savings — its simplicity and equipment flexibility for easy adaptation to varying operations — its uniform results and lower installation and operating costs — have given new high production efficiency to hundreds of well-known industrial plants.

Wherever drying, baking, dehydrating, pre-heating and similar operations present a problem, the Near Infra-red Process warrants investigation. Its utility is widespread and its employment is increasing rapidly. Case histories of the many installations reveal the highly successful utilization for products of many varying types. Send, today, for evidence applicable to your particular operation.

CONSERVES

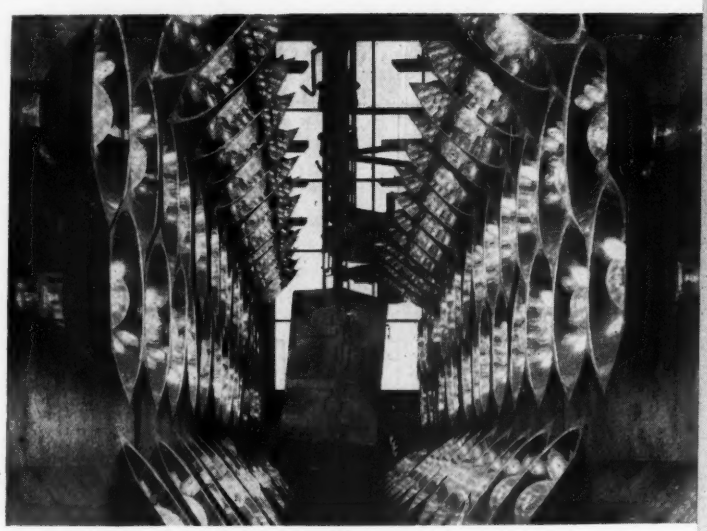
TIME
Spectacular speed on many operations cuts hours to minutes, substantially reducing production costs.

SPACE
Gives more production per square foot of floor space. Equipment may also be suspended from ceiling or wall.

ENERGY
Substantial reductions in power costs result on many installations.

MATERIAL
Provides uniform results that reduce rejects as every piece is processed under identical conditions.

MAN POWER
Simplicity of the process eliminates need for skilled operators. Output is greater per man-hour.



FOR EXAMPLE—

Pictured here is a Fostoria Infra-red tunnel installation in a (censored) war plant. Artillery shell boxes first pass through a paint spray booth and then move through the Infra-red baking zone on a conveyor.

Baking time is 6 to 7 minutes compared to the former normal air drying period of 2 to 4 hours.

From baking of paint to the drying of ink, dehydrating textiles and preheating metal fittings, Infra-red is setting a new high in production efficiency.

For Pretesting and Recommendations

CALL YOUR FOSTORIA INDUSTRIAL SERVICE CENTER

Fostoria Industrial Service Centers, located in principal cities, are properly equipped and well qualified to solve your baking, drying, dehydrating or preheating problem. If their practical tests prove the Infra-red Process to be a logical solution, the proper equipment to do the job is recommended. The service provides installation supervision and stands by to help the user obtain and maintain forecasted results. Request this service, now, without obligation.

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INFRA-RED
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PARA-SPHERE
FOR BAKING • DRYING
PREHEATING • DEHYDRATION

To Help You Plan and Estimate Wiring Installations

AUSTIN

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OUTLET BOXES
SWITCH BOXES
BAR HANGERS
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BOX CONNECTORS
HEAVY WALL CONDUIT FITTINGS
THIN WALL CONDUIT FITTINGS
BUSHINGS AND LOCKNUTS
CONDUIT AND CABLE STRAPS
R E A FITTINGS
TOOLS
LUGS
NIPPLES
WIRES AND CABLES
ARMORED CABLE
THIN WALL CONDUIT
HEAVY WALL CONDUIT

These are just some of the items shown in our new 1942 144-page catalog. It is full of useful information and contains hundreds of illustrations that will be most helpful to you. Send for your copy today —ask for Catalog No. CF17.

THE M. B. AUSTIN COMPANY
110 S. DESPLAINES ST. CHICAGO

Sherman HEAVY DUTY LUGS

Plenty of thickness and weight for big loads.

Flat contact surface for low resistance.

Exceptionally deep socket.

No sharp edges or burrs. Bright and clean.

Write for catalog which gives full specifications on all types of Sherman Lugs.

H. B. SHERMAN MFG. CO.
BATTLE CREEK, MICH.

In the News

[FROM PAGE 94]

tures and personally conducted tours of a six-booth demonstration of the theory, application, installation and distribution, of infra-red equipment in industry.

Hyre Electric Company, electrical contractor and motor service shop, is one of the 39 F. I. S. (Fostoria Industrial Service) representatives in the United States and Canada. Since infra-red heat is a highly engineered proposition and must be custom built for specific industrial applications, these service depots have been set up to give counsel to industry on its individual problems.

More than 250 industrial representatives in the Chicago area heard Fostoria representatives and engineers outline the importance of infra-red heat in our war industries and were given a glimpse at the tremendous post war applications of this comparatively new development.

ROUSH HEADS K. C. ELECTRICAL GROUP

C. G. Roush, Westinghouse Electric and Mfg. Co., was elected president of The Electric Association of Kansas City, at a recent meeting of that organization in Kansas City, Mo. Elected on the same ballot were the following officers—vice-presidents: H. H. Kuhn, K. C. Power and Light Co.; G. G. Burkholder, Burkholder Electric Co.; E. G. Agee, Lamp Dept., G. E. Co.; J. W. Puckett, General Electric Supply Co.: K. G. Gillespie, Jenkins Music Company. H. C. Davis, K. C. Power and Light Co., is the treasurer and Harry E. Moore the secretary-manager.

Members of the Board of Directors include: J. A. Ekstrom, George Fiske, S. W. Fries, Fred E. Geiss, E. J. Goetze, John Launder, C. H. McClean, E. J. McGrannahan, Joe Porter, Jr., W. E. Saylor, H. E. Scheark and G. L. Taylor.

At the conclusion of the meeting, S. W. Fries presented retiring president Earl Goetze with a gold wristwatch, on behalf of the Association, in appreciation of his services as president during the past year.

MARYLAND CONTRACTORS ELECT OFFICERS

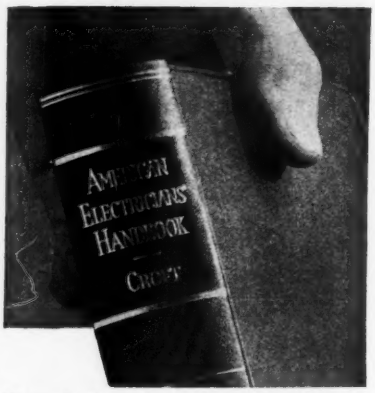
The Electrical Contractors Association of Maryland met on January 11 at the Belvedere Hotel in Baltimore to elect their officers and board of Directors for the ensuing year.

Charles H. Stark was re-elected president, Arthur Raffel elected vice president and Edward Henry, Secretary and Treasurer.

Vernon Miller, Hagerstown and J. Roland Stotzenback, John F. Heath and Frank Meredith all of Baltimore were elected to the board of Directors.

Get the right answer *FAST*—for more efficient more profitable handling of

EVERY TYPE OF PRACTICAL ELECTRICAL JOB



Thousands of men have used previous editions of this famous handbook as a working guide of everyday usefulness. Now it is ready to help you too, in a big new 5th edition—600 pages larger—brought up to date—*more than ever the one great pocketbook of practical electricity for you.*

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Revised by CLIFFORD C. CARR
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THIS book is packed from cover to cover with the facts which every man engaged in electrical work needs to have constantly at hand. From clear explanation of the fundamentals of electricity to suggestions for remedying the troubles of electrical equipment, the information is the kind that helps practical electrical men select and install commercial electrical apparatus and materials intelligently for the performance of specific services, operate electrical equipment efficiently, and maintain it at high operating efficiency.

1600 PAGES OF

practical data, helpful pointers, explanatory illustrations and diagrams, useful rules, recommendations, and short cuts, and much descriptive information on modern electrical practice. 5 x 7½. 1177 illustrations.

PRICE ONLY $5.00

COVERS:

- conductors
- circuits and circuit calculations
- general electrical equipment and batteries.
- generators and motors
- transformers
- outside distribution
- interior wiring
- electric lighting
- etc.

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Send me Croft's American Electricians' Handbook for 10 days' examination on approval. In 10 days I will send $5.00 plus few cents postage, or return book postpaid. (Postage paid on cash orders. Same return privilege.)

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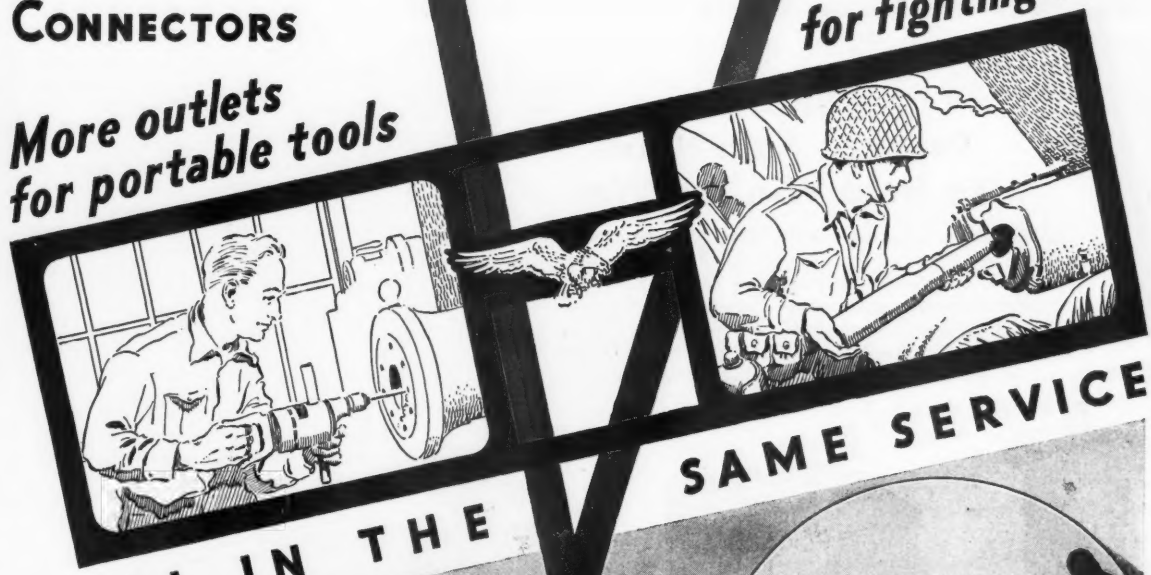
H & H POLARIZED RECEPTACLES

PLUGS and CONNECTORS

More outlets for portable tools

More output for fighting tools



ALL IN THE SAME SERVICE

Give more power to MAN-power *through* more Outlets for portable tools! Add to flexibility of plant-equipment with additional power connections for light machines! Here's a way for the electrical Contractor or plant electrician to *extend* production facilities,— to further "energize" manufacturing operations or plant-conversion jobs.

H & H provides many popular types of Polarized Receptacles, Plugs and Connectors, — built for rough handling in war-driven manufacturing. Two, three and four-wire devices, in 10, 20, 30 and 50 Ampere capacity. Shown here are a few representatives of our complete line for Industry's *current* needs.

HART & HEGEMAN DIVISION,
ARROW-HART & HEGEMAN ELECTRIC COMPANY, HARTFORD, CONN.

Latrobe PRODUCTS

★ FLOOR BOXES ★ WIRING SPECIALTIES ★

HIGH QUALITY

EASILY INSTALLED

Save Precious Man Hours To *Help* Win the War

Every human occupation must be mobilized for the purpose of Victory.

Time saved in installing convenient Latrobe Floor Boxes and Wiring Specialties means more time for vital war production. For all industrial, commercial and residential jobs, whether temporary or permanent, Latrobe Products are preferred also because of their dependability and long life.

No. 100 Box with No. 206 Nozzle

Latrobe Non-Adjustable Watertight Floor Boxes, with 3½ in. cover plates are approved for installation in wood floors.

2½ in. Conduit attached to No. 403 Insulator Support with No. 466 Pipe Hanger.

No. 130 Adjustable Floor Box with No. 207 Bell Nozzle

Tapered Unit Receptacle fits tapered opening in adjusting ring.

FLOOR JUNCTION BOXES

5" x 5" x 4"

Variety of boxes with adjustable covers in stock for prompt shipment. Cover plates plain without screw plugs unless otherwise specified.

No. 605 Conduit Bender

Deep 1 in. internally threaded socket takes pipe handle direct.

FOR BEST RESULTS
STOCK LATROBE PRODUCTS
SELL LATROBE PRODUCTS

DURABLE

ECONOMICAL

FULLMAN MANUFACTURING CO. QUALITY AT LATROBE OB SUPREMACY LATROBE, PA.

FULLMAN MANUFACTURING CO.
LATROBE . . . PENNSYLVANIA

In the News

MARK-UP OF FREIGHT CHARGES

Jobbers, dealers and distributors of iron and steel pipe in 12 Western states were reminded by the OPA that there are two freight allowances that may be included in their maximum prices; one that may be "marked up" and the other not.

As provided in Revised Price Schedule No. 49—Resale of Iron and Steel Products—the freight from mill basing point to buyer's location is included in maximum prices for these products, and under the formula for determining prices, is subject to a percentage mark-up.

At the same time the schedule provides that, for specified pipe shipped from jobbers' stocks in 11 states and two locations in a twelfth state, any freight actually paid in excess of 30 cents per hundredweight, to equalize freight from the mill basing point to the buyer's location, may be added to the price of the product. The charge for this freight in excess of 30 cents per hundredweight, OPA warned, should not be marked-up but should be added to the price separately. None of the freight rates used in calculating the charge should be marked-up as part of the calculation.

The provision reads in part: "that on all shipments of standard pipe, seamless pipe, water well casing, large OD pipe, line pipe and wrought iron pipe originating from jobbers' stocks in the States of Washington, Idaho, Montana, Oregon, Wyoming, California, Nevada, Utah, Colorado, Arizona, New Mexico and Texas (El Paso and Pecos only) and shipped to points within the above mentioned states or to points west of the 103rd meridian within the States of North Dakota, South Dakota, Nebraska, and Texas, any freight actually paid in excess of the sum of 30c. per 100 lbs. may be charged, notwithstanding that freight equalization of more than this amount may be required by the provisions . . . establishing maximum delivered prices at such points of delivery".

TRADE-IN MOTORS VALUED UNDER MPR 136

Under an official interpretation of Maximum Price Regulation 136, the value of motors which are traded in for new motors is determined by Section 1390.11, *sales of second hand machines and parts*, of that regulation.

NEW MANAGER FOR K. C. ASSOCIATION

Harry E. Moore is the new secretary-manager of The Electric Association of

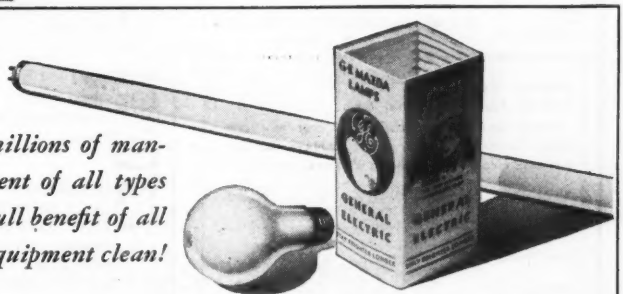
UMI

ARE YOU THROWING AWAY 29 YEARS OF RESEARCH?

WHEN you allow dust and dirt to accumulate on lamp bulbs and fixtures you may be throwing away as much as half the light you're paying for. That means you're losing the benefit of many years of General Electric lamp research. In the case of the 300-watt bulb, for example, you are throwing away the 40 per cent increase in efficiency effected by G-E research since the lamp was introduced in 1914.

Why deny yourself the added light G-E research has given you? Start a regular cleaning schedule today! Get all the light you pay for! Where lighting units cannot be easily removed, a safety ladder should be used.

General Electric scientists have devoted millions of man-hours of research to the steady improvement of all types and sizes of G-E MAZDA *lamps. Get the full benefit of all the years of G-E research by keeping your equipment clean!*



G-E MAZDA LAMPS

GENERAL ELECTRIC

HERE IS "LONG LIFE" ★ AGAIN!

NO STARTERS
NO HIGH VOLTAGE
with
3000-HOUR
GUARANTEED
LAMPS

That's
ARTKRAFT
HOT CATHODE
Fluorescent
Lighting

SIGNS OF LONG LIFE ★ The registered Trademark of The Artkraft Sign Co., the world's largest manufacturer of all types of signs, (now engaged 100% in war work). This strong institution is your permanent assurance of ready lamp replacements.

We wish to express our thanks to all those who responded to our first announcement, last month, of our new product. This response was very gratifying and we are doing our best to handle all correspondence promptly.

WHOLESALERS:
Write for our proposition.

FIXTURE MANUFACTURERS:
Write for details on constant voltage manufacturing license.

Free! NEW ILLUSTRATED CIRCULAR USE THIS COUPON

Artkraft Sign Co.
1113 E. Kibby St., Lima, Ohio.
Please send without obligation your new profusely illustrated circular F102 ☐. Have qualified Artkraft Fluorescent Lighting Engineer call ☐.

Name.....
Position.....
Firm Name.....
Address.....

The
STARTLING FACTS
are these

- 3,000-HOUR LAMP GUARANTEE. Rated 5,000 to 6,000 Hours.
- NO STARTER SWITCHES. Artkraft resonant starting eliminates this trouble-maker.
- CONSTANT VOLTAGE POWER PACK. Gives efficient operation at 85 to 135 volts. Can also be used on 220— and 440-volt systems, single or three-phase. Cannot short circuit the line.
- 100% POWER FACTOR at rated voltage. 98% or over within 85 to 135-volt range.
- "EASY MOUNT" LUMINAIRE ALLOWS INSTANT REMOVAL WITHOUT TOOLS, FOR CLEANING NON-FERROUS REFLECTOR OR LAMPS.
- CONSTANT TEMPERATURE HOT CATHODES. Light at 40° below zero, operate efficiently at low temperatures.
- STROBOSCOPIC (FLICKERING) EFFECT REDUCED.
- MORE LIGHT FOR THE SAME CURRENT.
- FIELD TESTED UNDER ADVERSE CONDITIONS FOR OVER FIVE YEARS.
- MODERATE FIRST COST. RADICALLY REDUCED MAINTENANCE COST. Lamp replacements are less frequent, starter replacements eliminated, ballast replacements unknown, man-hours saved by making these replacements unnecessary.

ARTKRAFT HOT CATHODE **FLUORESCENT LIGHTING**
Division of The Artkraft Sign Company.
General Offices. 1113 E. Kibby St. Lima, Ohio, U.S.A.

LONG LIFE DEPENDABILITY

In the News

[FROM PAGE 98]

Kansas City, Kansas City, Mo. He recently took over the position left vacant when Jerry Weston moved to Washington, D. C., as assistant manager of the National Electrical Contractors Association.

Mr. Moore, who is widely known in the electrical industry, came to the Kansas City group with a background that especially fitted him for the job. For the past 15 years he was connected with the Kansas City Power and Light Company in sales and service executive positions. Prior to that time he was engaged in the electrical contraeting business.

COPPER NOT ADEQUATE

The following statement has been issued by H. O. King, Director of the WPB Copper Division:

"Recent statements quoted in the press have conveyed the impression that the supply of copper is adequate to meet all military and essential civilian requirements.

"Widespread acceptance of such statements would constitute a threat to our entire war production program. The supply of copper is not adequate and never will be while this war is on.

"A number of WPB limitation orders have eliminated the use of copper from thousands of civilian products. The Army and Navy have saved considerable amounts of copper by reducing their requirements wherever possible. A vigorous program of substitution has been carried on.

"Further, several hundred million dollars are being spent on facilities for new projects to increase primary production, while scrap programs have resulted in the collection of twice the tonnage which was expected at the beginning of 1942.

"Because some of these efforts have been successful, and have resulted in a reduction of the over-all deficit is no reason for the relaxation of restrictions on use, or relaxation of our efforts to acquire every pound of copper wherever it is available."

COMING MEETINGS

National Electrical Manufacturers Association—Spring Meeting, Palmer House, Chicago, Illinois, April 19–23.

Midwest Power Conference—Palmer House, Chicago, Illinois, April 9–10.

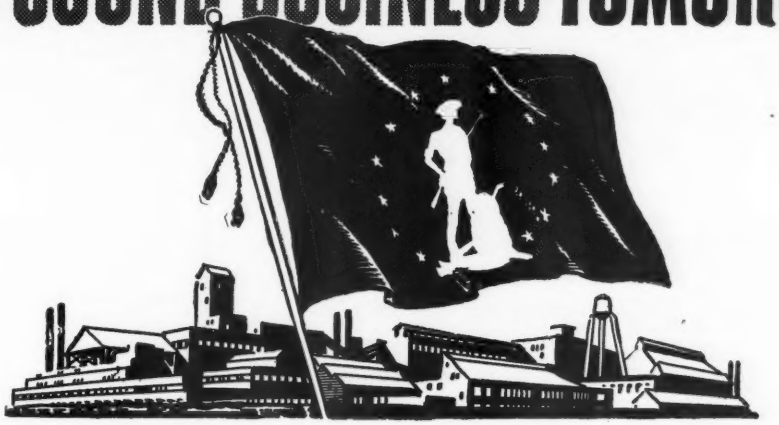
North Central Electrical Industries—Wartime conference, Hotel Radisson, Minneapolis, Minn. Participating groups include: North Central Electric Association; Minnesota Municipal Utilities; Minnesota Electrical Inspectors; Minnesota Electrical Council (contractors and dealers); and North Central Electrical Industries. April 26–27.

National Fire Protection Association—Palmer House, Chicago, Illinois, May 10–14.

International Association of Electrical Inspectors—Western Section, 39th annual meeting, Chicago, Illinois, Sept. 13–15.

UMI

FOR VICTORY TODAY AND SOUND BUSINESS TOMORROW



Get This Flag Flying Now!

This War Savings Flag which flies today over companies, large and small, all across the land means *business.* It means, first, that 10% of the company's gross pay roll is being invested in War Bonds by the workers voluntarily.

It also means that the employees of all these companies are doing their part for Victory . . . by helping to buy the guns, tanks, and planes that America and her allies *must* have to win.

It means that billions of dollars are being diverted from "bidding" for the constantly shrinking stock of goods available, thus putting a brake on inflation. And it means that billions of dollars will be held in readiness for post-war readjustment.

Think what 10% of the national income, saved in War Bonds now, month after month, can buy when the war ends!

For Victory today . . . and prosperity *tomorrow,* keep the War Bond Pay-roll Savings Plan rolling in *your* firm. Get that flag flying now! Your State War Savings Staff Administrator will gladly explain how you may do so.

If your firm has not already installed the Payroll Savings Plan, *now is the time to do so.* For full details, plus samples of result-getting literature and promotional helps, write or wire: War Savings Staff, Section F, Treasury Department, 709 Twelfth Street NW., Washington, D. C.

EVERYBODY EVERY PAYDAY AT LEAST 10%

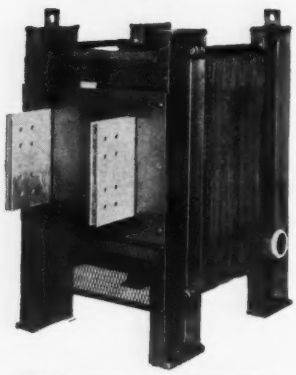
Save With

War Savings Bonds

This Space Is a Contribution to America's All-Out War Program by

ELECTRICAL CONTRACTING

Write your own ticket
on transformer
specifications-with
Newark
TRANSFORMERS



This was a tough one
—but not for Newark. A dry type transformer to get 10,000 amps., low voltage, for a special furnace. Newark is at home on jobs like this.

We can build them to fit—with twenty years of "know how" behind them. Dry type transformers in standard or special types using components of proven correctness and quality, in capacities from 1 to 150 kva. Early delivery dates may surprise you, too. Newark transformers have made as fine a record in production as they do in performance. Tell us your conditions — phone, wire or write. Bulletins on request.

Do you need
SUBCONTRACT help?

Call upon the facilities of our Subcontract Division, established long before Pearl Harbor. Floor space, machines, men available. Also the cooperation of a skilled engineering staff. Our record on this work demonstrates exceptional ingenuity in dealing with a wide variety of difficult manufacturing problems. Production time schedules always met, frequently bettered. Depend upon our production drive to get things *done*, and upon our 20 years of experience to get them done *right*. Our facilities may be just what you need. Phone or wire

SUBCONTRACT DIVISION
(Phone, Bigelow 3-3577)

Newark
TRANSFORMER CO.
17 FRELINGHUYSEN AVE.
NEWARK, NEW JERSEY

TRANSFORMERS FOR ALL PURPOSES

In the News

[FROM PAGE 100]

DON'T BURN RUBBER

Rubber control order M-15-b states that the insulation of wire or rubber covered cable shall not be destroyed by burning or other means. It is intended that this rubber be salvaged by mechanical methods.

A further supplement, M-15-bl, provides regulations for the manufacture of rubber insulating tape, limiting the proportion of crude and reclaimed rubber in a given quantity of tape.

The supplement provides further, regulations on the manufacture of insulated wire and cable. Miscellaneous provisions include that "white" conductors unless otherwise specified shall be designed for grounded neutral conductor of 600 volts, a.c. wiring system and shall contain no rubber of any kind. No crude, synthetic, scrap, or reclaimed rubber shall be used on *knob and tube or cleat* work. Rubber jackets, belts or sheaths shall not be used for mechanical protection of wire or cable except for non-leaded submarine cable, railroad signal service, wet locations, operating voltages in excess of 3000 volts, and for operation at conductor temperatures of 70° C. or higher.

RAYMOND HEADS CHICAGO LIGHTING INSTITUTE

Ralph G. Raymond, former assistant manager, lighting sales, Commonwealth Edison Company, was recently elected president of the Chicago Lighting Institute. He was also made manager, lighting sales of the Edison Company.

SHOP SUPERINTENDENT, A. A. Gruening, Electrical Engineering and Construction Co., is up to his ears in work these days. With the motor service shop operating at 250 percent normal, and 95 percent of the machine shop doing war subcontract work, Augie never has a dull moment.

Mr. Raymond, formerly managing director of the Chicago Lighting Institute before his association with the Edison Company, succeeds Oliver R. Hogue, who retired from both positions December 31.

BOTTLENECKS IN MOTOR INDUSTRY

Problems arising from scarcity of critical materials and the need for simplification and standardization in the electric motor industry were discussed at recent meetings of the Fractional and Integral Motor Industry Advisory Committees held with officials of WPB.

Carbon steel shafting is at present the most serious bottleneck in the electric motor industry, with copper shapes second in line as a scarce material.

Standardization in the field of generator sets driven by small internal combustion engines is urgently needed. The Government is having difficulty in getting repair parts due to the great variety of gasoline engines used for generator sets of a given rating. The engine parts are not interchangeable and hence many different kinds of repair parts must be stocked.

A panel of industry men was appointed to study this problem and make recommendations on simplification and standardization.

The manufacture of small ball bearings used in the fractional horsepower motor industry is in a critical situation, according to a panel report to the Fractional Horsepower Advisory Committee, and recommendations for conserving the bearings were made by the panel.

Conservation of other critical materials through substitution and standardization was urged. An effort is being made, to standardize flanges and shafts for close-coupled Navy pumps so that one motor will fit a variety of pumps.

T. E. AUSTIN, Austin Electric Co., Charlotte, N. C., electrical contractor, handled the electrical work on some of the East's large army camps.

for FASTER - BETTER WELDING
.....TIREX SUPER Flexible CABLES

TIREX Welding Cables are designed for use on welding jobs where speed is vital and results count. By using cables specially designed for welding equipment, time can be saved and output can be increased on maintenance, repair or new construction jobs.

The outstanding feature of TIREX Welding Cables is super-flexibility—obtained not only by employing a multitude of fine copper wires in the stranded conductor but also by the use of a specially applied cotton braid separator between the stranded conductor and the rubber jacket. This feature of super-flexibility, plus the exceptional electrical and physical properties of special TIREX rubber compound used, makes TIREX Welding Cable the ideal electrode cable.

RUBBER SHEATHED WELDING CABLE
Super-Flexible, Single Conductor

A. W. G. or M. C. M.	No. of Strands 234	O. D. Inches	Net Pounds per 100 ft.	Welding Current Capacity Amperes	Voltage Drop Max. Current Volts per 100 ft.
	420	.39	10	50	3.71
	686	.40	13	75	3.58
8	1078	.50	20	100	3.18
6	1372	.50	23	150	3.70
4					3.92
3		.56	29	200	3.88
	1715	.63	36	250	3.72
2	2156	.68	43	300	3.68
1	2695	.75	54	375	
1/0	3381				3.51
2/0		.82	67	450	3.41
	4263	.90	83	550	3.12
3/0	5341	.95	96	600	2.80
4/0	6321	1.03	115	650	
250	7595				
300					

All TIREX CABLES - for the duration - conform to government regulations controlling the use of copper and rubber. If you need cables to keep welding equipment going on war work you can avoid cable failures and replacements, save copper and the other critical materials and get the results you want with TIREX.

Simplex WIRES and CABLES
Simplex Wire & Cable Co., 79 Sidney Street, Cambridge, Mass.

FORTY-THREE STEPS OF CONTROL

in four inches!

ARMY E NAVY

The new Ward Leonard 4-inch Pressed Steel Rheostat offers the happy combination of a small sturdy power rheostat with a large number of steps and ample current carrying capacity. Like all Ward Leonard Pressed Steel Rheostats this model may be arranged for front of board, rear of board and multiple assembly mounting. Other types and sizes also available. Send for descriptive bulletins.

WARD LEONARD
RELAYS • RESISTORS • RHEOSTATS
Electric control (WL) devices since 1892.
WARD LEONARD ELECTRIC CO., 28 SOUTH STREET, MOUNT VERNON, NEW YORK

RE-LIGHTING

the new manpower / production *requirement*

Vital to plants built and lighted for daylight operation

Most plants operating today were designed and built for peacetime, *daylight* working schedules. Wartime production demands night work. *Lighting based on daylight conditions is inadequate to serve the needs of night workers.*

Night production is generally acknowledged to be anywhere from 20% to 40% less efficient than daytime production. And poor lighting, with its consequent eyestrain, fatigue, and lower working efficiency, is a major cause of this slump.

Re-lighting for 24-hour-a-day war production is the easiest, most economical remedy for this condition. Re-lighting does not mean discarding your present lighting system. It merely means bringing the equipment you have up to date by relocating lamps to eliminate glare and shadow; increasing lamp wattages, re-spacing lamps, installing additional equipment to insure uniform lighting levels throughout your plant. A Silv-A-King lighting engineer can tell you exactly.

Silv-A-King has specialized on industrial lighting for 21 years. Silv-A-King quality equipment (fluorescent or incandescent) plus a Silv-A-King "engineered layout" makes an unbeatable combination.

BRIGHT LIGHT REFLECTOR COMPANY, INC.
1033 Metropolitan Avenue, Brooklyn, N. Y.

Send for your copy of our 16-page book: "Light Is An Essential Production Tool"

SILV-A-KING MAKES *Light* WORK FOR YOU

In the News

[FROM PAGE 103]

CONSERVATION PROGRAM

A five-point conservation program for 1943 has been launched by W. C. Burleigh, Director of the Service Equipment Division of WPB.

The program, stressing particularly maintenance of equipment, manpower conservation, and proper handling of inventories, is directed to all types of businesses whose operations have been affected by wartime restrictions. It cannot succeed, however, unless every point is carefully checked against each individual operating set-up and an effort made to supplement the rules wherever possible with management practices which will effect maximum efficiency and economy.

The five-point program:

1. Save Equipment—Check operating equipment regularly. Repair parts can be procured for essential needs. Increase the work-load on present equipment if possible. Don't try to replace equipment or to buy new equipment unless it is absolutely essential to the war program.

2. Keep your building in condition—Institute an all-out conservation program. Take proper fire precautions, and in particular clean out any accumulations of waste or other fire hazards. Make small repairs before they become big ones.

3. Reduce Operations—Curtail deliveries as far as possible. Eliminate unnecessary delivery schedules. Operate on a cash basis if possible to conserve office machinery and manpower. Wrap goods only when necessary. Encourage customers to carry their own purchases.

4. Watch your Stock—Do not overbuy. There will be enough to go around if only immediate requirements are provided for.

5. Cooperate in the Salvage Campaign—Start a salvage program in your store and make sure all waste materials are contributed to the local salvage committee. Frequently, there are sizable stocks of salvage materials concealed in basements or storage areas.

***OLD TIMERS** in Kansas City's electrical contracting and maintenance field are (L to R) Fred E. Geiss, John E. Launder and R. W. Hodge. All three are past presidents of the Electric Association of Kansas City.*

Your Market Place

FOR ELECTRICAL EQUIPMENT

Here are the products of 290 manufacturers described and classified with more simplicity than a mail order catalog.

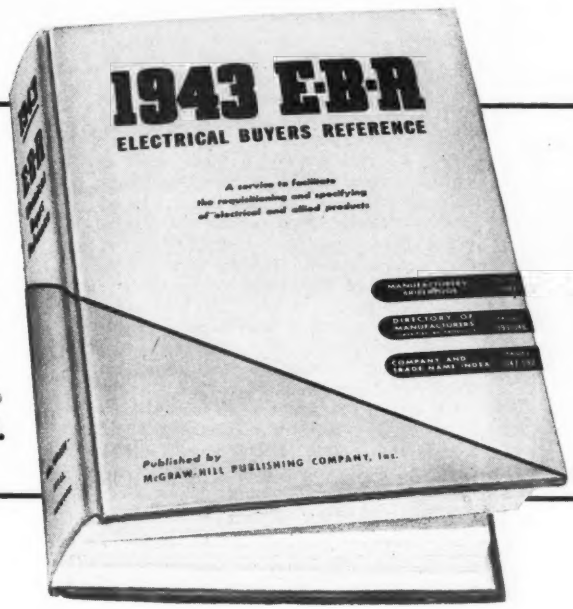
It tells you:

What it is.

How it's used.

Who makes it.

Where you can get it.


1943 E·B·R
ELECTRICAL BUYERS REFERENCE
A service to facilitate the requisitioning and specifying of electrical and allied products
Published by McGRAW-HILL PUBLISHING COMPANY, Inc.

290
MANUFACTURERS
369
BRIEFALOGS*

● As the mail order catalog brought the market of every day needs to the rural dweller's doorstep, so Electrical Buyer's Reference brings the nation's electrical equipment market to your desk top.

In these days of specialization and high priority buying, the 1943 ELECTRICAL BUYER'S REFERENCE emerges bigger and better than ever before.

This handy reference was conceived for the purpose of creating a special MARKET PLACE for ELECTRICAL EQUIPMENT... so simply arranged, so concisely classified that the buyer can put his finger on the correct, nearest and best maker and seller of the products he wants.

Such a work required specialists skilled in electrical engineering and the art of cataloging.

*The BRIEFALOGS are our own original method of cataloging—being condensed descriptions and specifications of the products... something you just can't associate with negligees or pajamas, but with electrical equipment.

When you are looking for electrical equipment, think of ELECTRICAL BUYER'S REFERENCE—the only handy buyer's reference with the BRIEFALOGS... conceived especially for specialists in purchasing and specifying.

Keep it within your easy reach. You will have the nation's MARKET PLACE of ELECTRICAL EQUIPMENT at your fingertips.

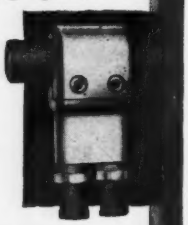
ELECTRICAL BUYER'S REFERENCE

McGRAW-HILL PUBLISHING COMPANY • 330 W. 42nd STREET, NEW YORK, N. Y.

"You have ALL Types of Tees to choose from—

—in the COMPLETE line"

All in one catalog, for your handy selection—*every* good type of tee connector... Each one carefully designed and tested, and manufactured under rigid engineering supervision.



Penn-Union Type HFM, with one-bolt or 2-bolt hinged clamp for the main. One or more branches can be connected afterward. Multi-slit tapered sleeve assures permanent grip on branch.

Penn-Union Hinged E-Z Tee takes a wide range of branch sizes. One-piece design makes installation easy. Tap connections can be made at any time.

Clamp Type Tees for all sizes of tubing and cable—a complete line. Machined contact surfaces.

Types for All Combinations—for connecting flat bar, run or tap, to tubing or cable. Also "general utility" tees that take a wide range of conductor sizes.

Penn-Union E-Z Tee is ideal for accommodating a large range of conductor sizes on both the main and branch. Will not loosen. 2, 3 or 4-post.

Penn-Union fittings are preferred by utilities, industrials, electrical manufacturers, contractors—because they have found that *Penn-Union on a fitting is their best guarantee of Dependability.*

PENN-UNION ELECTRIC CORPORATION
ERIE, PA. *Sold by Leading Jobbers*

PENN-UNION
Conductor Fittings

In the News

[FROM PAGE 104]

DEFERMENTS GRANTED

In furtherance of the program to keep essential workers in activities which contribute to the war effort, the Selective Service Bureau of the War Manpower Commission has advised local boards of 34 essential occupations in repair and hand trade services, including automobile mechanics and electricians, who may be deferred as "necessary men."

Similar instructions also were sent to local boards, for their guidance when considering occupational classifications.

It was emphasized with the announcement of these listings of essential occupations, that they are merely those which so far have been certified by the War Manpower Commission and that they are by no means exclusive. Men in other occupations in these activities likewise may be deferred as "necessary men," if their local boards are convinced that they are essential in their jobs.

Pointing out that the War Manpower Commission had certified that repair and hand trade services are essential to the support of the war effort, the Selective Service Bureau said that its occupational bulletin on this activity covers repair of elevators, radios, refrigerators, clocks, power laundry equipment, industrial and scientific equipment; armature rewinding; electric, gas and plumbing installations in domestic, commercial and industrial buildings, and many others.

While the occupational bulletins list essential occupations in the specified activities, such bulletins serve only as a guide to local boards and not as orders for "blanket deferment" of men engaged in them. Local boards must determine that an individual registrant is a necessary man in a particular occupation before granting him an occupational classification.

In classifying a registrant employed in activities essential to the support of the war effort, local boards give consideration to the following:

(a) the training, qualification, or skill required for the proper discharge of the duties involved in his occupation;

(b) the training, qualification, or skill of the registrant to engage in his occupation; and

(c) the availability of persons with his qualification or skill, or who can be trained to his qualification, to replace the registrant and the time in which such replacement can be made.

FORESIGHT AND PLANNING enabled L. W. Andre, Capital City Electric Co., Des Moines, Iowa, to maintain a sufficient stock of materials to quickly render emergency service. The secret—he sticks to high priority electrical construction work permitting material replacements.

HEDGES APPOINTED TO COMMITTEE

M. H. Hedges, Research Director of the International Brotherhood of Electrical Workers, has accepted appointment on the Planning Committee of the War Production Board.

Mr. Hedges has been made available on a part time basis by the Electrical Workers to bring labor's outlook to the Committee, of which Robert R. Nathan is Chairman, in its studies of immediate and long range problems for the Office of the Chairman of the War Production Board.

His appointment was recommended by Labor Production Division Director Wendell Lund after consultation with President William Green of the American Federation of Labor.

Mr. Hedges has been prominent in labor circles for many years. In addition to heading the Research Department of the Brotherhood of Electrical Workers, he has four times been a labor consultant to the International Labor Office at Geneva, and is a consultant to the Social Security Board. He serves as a member of the Negotiating Committee of the Trades and Labor Council of the Tennessee Valley Authority. He is also a member of the Board of Trustees of the National Planning Association and was one of the founders of that organization.

Priorities

RESTRICTED MATERIALS RELEASED

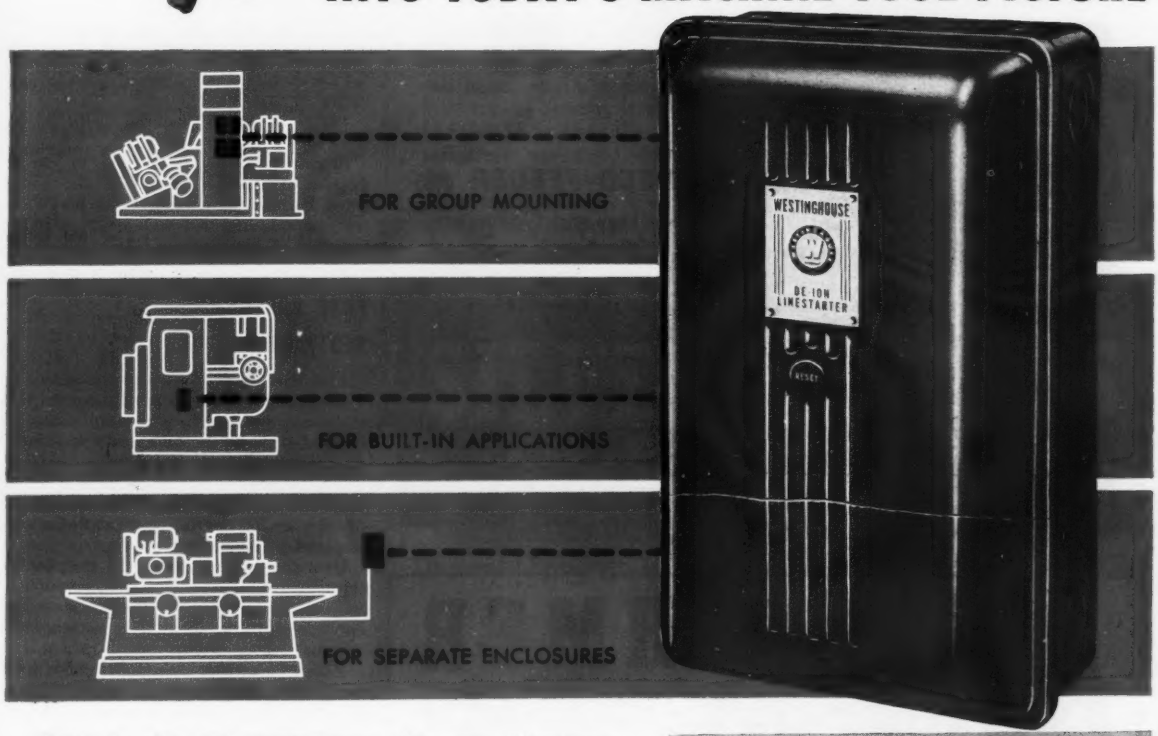
By an amendment of Priorities Regulation No. 1, issued by WPB persons who have purchased material with the assistance of preference ratings may, under certain circumstances, sell it or make use of it for purposes other than the one for which it was originally obtained.

As amended, the basic document of the priorities system now provides that, if for any reason material obtained with priority assistance or by allocation cannot be used as first intended, the owner may:

NEW LINESTARTER

FITS PERFECTLY

INTO TODAY'S MACHINE TOOL PICTURE



Both in size and performance, this new Linestarter measures up to the requirements of modern machine tool design for compactness, easy mounting and dependable, trouble-free operation.

It is compact—ideal for group mountings and built-in applications. No crowding—all parts are quickly front-accessible.

It is flexible—coil is front-removable. Overload relay may be adjusted for either manual or automatic reset.

Sturdy and efficient, it is designed to give across-the-line starting, stopping, and overload protection under grueling 3-shift schedules. The armature is self-aligning—features a knife-edge bearing of nitrided steel that guarantees positive, accurate contact alignment. Service life of contacts is greatly increased by new, double-break construction.

Ask your Westinghouse representative for further details or write for Bulletin 3185. Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa., Dept. 7-N. J-21254

NEW DESIGN FEATURES

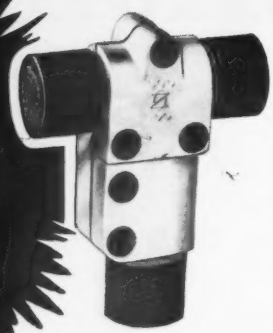
SIZE 2 LINESTARTER

for A. C. polyphase motors up to 15 hp, 220 volts; 25 hp, 440, 550 or 600 volts

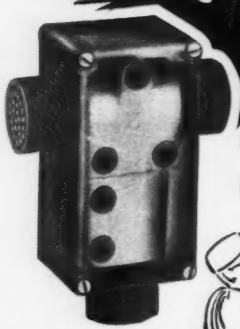
- "De-ion" arc quenching—prolongs the contact life.
- Hand or automatic reset Bi-metal overload relay.
- Knife-edge bearing—an exclusive Westinghouse feature.
- Interlocks—space for as many as four.

Westinghouse MOTORS AND CONTROLS

COMPACT T-CABLE TAPS



TAP



WITH COVER

FOR THOSE INDOOR **EXPOSED FEEDER** JOBS

O. Z. T-Cable Tap and Cover are used where a 90° tap is required on a main feeder. The moulded two-piece Canvas Bakelite cover is quickly applied to the tap, completing a compact joint without the use of tape.

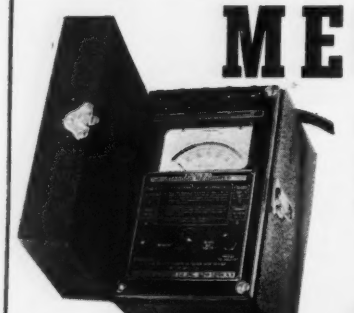
O. Z. ELECTRICAL MFG. CO.

262 BOND STREET • BROOKLYN, N. Y.

REPRESENTATIVES IN PRINCIPAL CITIES

3569

MEGOHMER



RELIABLE • ACCURATE • QUALITY

Our modern insulation testers make insulation testing easy . . . Entirely self-contained. Steady test potential of 500 volts DC, available at the touch of a switch. Direct reading in insulation resistance.

VARIOUS NEW MODELS AND RANGES — WRITE FOR BULLETINS

HERMAN H. STICHT CO., INC.
27 PARK PLACE NEW YORK, N. Y.

The Stone You Can Bend and Twist

Flex-Stone

DRESSES AND CLEANS ALL ELECTRICAL PARTS AND CONTACTS

What a job FLEXSTONE does! Cuts like an abrasive stone—but you can bend, twist it. *Won't break!* Thin, non-brittle. Sharpest abrasives are pressed into flexible core. Easily fits tight places. Smooths hardest contact points in relays, cutouts — cleans small commutators, switches, etc. Non-conductor — no short circuit. Rimac FLEXSTONE speeds electrical service. Send for *free sample!*

RINCK-McILWAINE, Inc., 16 Hudson St., New York, N. Y.

In the News

[FROM PAGE 106]

(1) use it to fill purchase orders placed with him which bear a rating of AA-5 or higher, or a rating at least as high as that upon which the material was obtained, provided such use is permitted by other regulations and orders controlling the production or distribution of the particular material or item;

(2) use it for his own needs, if he has been authorized to obtain material for such use by applying or extending a preference rating of AA-5 or higher;

(3) re-deliver the material to the person from whom he purchased it.

In case an owner is not able to use or dispose of material in any of the above ways, he may file a report with his WPB regional office, which will assist in redistribution of his property.

FUSE SALES RESTRICTED

Restrictions on sales of electric fuses by manufacturers have been tightened with the issuance of an amendment to Limitation Order L-161. They must now make deliveries only on orders rated A-1-j or higher.

The purpose of the amendment is to establish a more effective control over the distribution of electric fuses at the wholesale and jobbing levels.

Over-the-counter sales and distribution through retail stores to small consumers will not be affected by the change. The public will still be able to buy electric fuses as usual for all ordinary needs.

Persons who purchase electric fuses from others than manufacturers are not required to apply the rating prescribed in L-161, although wholesalers and jobbers must do so if they are purchasing from a manufacturer. However, a manufacturer may sell or ship electric fuses to another manufacturer without a rating.

EMERGENCY RATINGS EXPEDITED

A further step toward decentralization of the War Production Board has been made with the granting of increased authority for approval of individual emergency preference ratings to the field offices of WPB.

The 12 Regional Directors of WPB are now authorized to approve, countersign, and issue individual preference ratings for emergency repair, up to and including AA-1, in accordance with specific instructions to be issued from time to time by the Deputy Director General for Distribution. Further, Regional Directors may authorize the Deputy Directors to perform these functions.

In addition, the 110 district offices may for the first time grant ratings for emergency repair, up to and including AA-2X.

The authority delegated is limited to cases where the material for which the applicant seeks priority assistance does not exceed $500 in value.

WAR HOUSING GETS AA-3

A blanket preference rating of AA-3 has been assigned by the War Production Board to deliveries of materials for use in the construction of most of the war housing projects programmed by the National Housing Agency.

This action, which makes the up-rating automatic for the builder, affects the war housing for which preference rating orders P-55 have been issued to a builder, or P-19-d and P-19-h have been issued to the Federal Public Housing Authority.

In cases where the up-rating applies it is effective whether the war housing is publicly or privately financed, whether it is new construction or conversion of existing structures and whether the type of structure is permanent or temporary.

NEW PD-25F IN USE

Motor shops operating under the Production Requirements Plan have a new Form PD-25F. This form is used to apply for supplementary authorizations under PRP.

The new form, considerably simplified to make it easier for PRP units to submit information necessary to proper consideration of their applications, differs from its predecessor in two important respects. The first of these is that it may be used to apply for supplementary authorizations for advance quarters, as well as for the quarter in which it is submitted.

The second difference is that requests for supplementary authorizations must be made in terms of additional requirements only and not, as in the past, in terms of revised total requirements.

Space is provided in the new form for a required letter of transmittal, in which the following questions must be answered in full, if the application is to be considered:

1. What product or products will be manufactured from this additional material?
2. Is this product to be manufactured for military use, i.e., to be delivered to, or incorporated into material to be delivered to, the Army or Navy (including aircraft) or Maritime Commission?
3. Can complete units of this product be manufactured from your present inventory plus quantities previously authorized?
4. Are specific orders for this product (show contract numbers) being delayed pending authorization of the material requested?
5. Were these orders received since your most recent PRP application was filed?
6. If similar material was not included on previous applications, explain why it is now required for your product.
7. Is this application a request for material for receipt, or is it actually required to be put into production or use in the current quarter?
8. Do you have sufficient capacity to put this material into production?
9. How many previous PD-25F applications have been submitted for this PRP Unit for the quarter covered by this application?

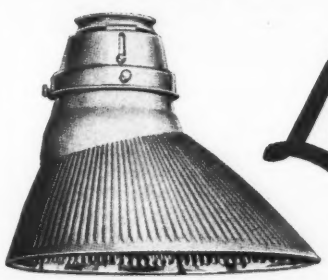
Bin LIGHTING

For full illumination of Parts Bins, Tool Crib Bins and Shelves, Stockroom Shelves, Carton Stacks, File Rooms, Library Stacks — wherever you need "quick, accurate seeing" from top to bottom, install PERMAFLECTORS, the silvered-glass reflectors especially designed for this purpose. Easily, quickly, inexpensively installed. Get prompt delivery . . . No priority on GLASS!

HIGH-EFFICIENCY PERMAFLECTORS of SILVERED GLASS

Conserve Critical War Materials
Assure Prompt Delivery!

Decrease Spoilage — Reduce Accidents — Speed Production



Light Up THE WEAK SPOTS IN YOUR PLANT!

Need MORE light, BETTER light here and there in your production line? ✪ Put in Permaflector "Auxiliaries" — the high-efficiency, silvered-glass reflectors that put the light where you need it, as you want it! ✪ A size and shape for any desired distribution. ✪ Easily, quickly, inexpensively installed without affecting work flow. ✪ Use Minimum Critical War Materials! ✪ Specify Permaflectors! ✪ A Pittsburgh lighting engineer will be glad to go over your plant without obligation!

PITTSBURGH REFLECTOR CO.

"Pittsburgh" Permaflector

402 OLIVER BLDG. • PITTSBURGH, PA.

Tear Off

Clip to letterhead. Sign. Mail for complete information, prices.

Safe-T-Glow

HIGH TENSION DETECTOR

SAFETY RULES call for that EXTRA precaution and additional RE-CHECK which SAFE-T-GLOW provides. Detects accidental tie-ins, crossovers, leakages and induced voltages . . . prevents serious injury and loss of life. SAFE-T-GLOW consists of a sensitive Neon tube, amplified by mirror reflector.

Model A for circuits 2,000 to 35,000 volts.
Model B for circuits from 35,000 to 220,000 volts.

TEST-O-LITE

Tests Everything Electrical from 100 to 550 Volts

Equipped with Neon light which tells instantly where trouble lies in circuits, fuses, cut-outs, motors, etc. Indicates hot or grounded wires. Tells AC from DC. SAVES PRECIOUS TIME. Has PATENTED safety features. Vest pocket size with clip. Lifetime guarantee. List Price $1.50 at leading jobbers.

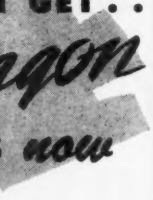
L. S. BRACH Mfg. Corp.
55-63 Dickerson St. Newark, N. J.

YOU CAN GET . .

Paragon

TIMERS *now*

If you need a Timer . . . order it from Paragon and early shipment will be made . . . provided, of course, you furnish the necessary priority rating. Even though Paragon is manufacturing extensive electrical equipment for the armed forces, it is making and shipping Time Control devices every day.



Timers are being used for more different applications today than ever. Send for a complete catalog today.

PARAGON ELECTRIC COMPANY
401 So. Plymouth Ct. • Chicago, Ill.

Paragon Chicago
BUILDERS OF ELECTRICAL EQUIPMENT SINCE 1905

In the News

[FROM PAGE 109]

CMP RESTRICTS INVENTORIES

Inventory restrictions under the Controlled Materials Plan were announced January 7 with the issuance of CMP Regulation No. 2.

The general purpose of the new regulation is to hold the aluminum, copper and steel inventories of manufacturers and other users to a maximum of 60 days' forward requirements. Acceptance of deliveries of controlled materials after April 1 is prohibited if delivery would increase inventories beyond the prescribed limits. Scheduling provisions require that every user of controlled materials apply for allotments, schedule deliveries and place orders in such a manner that deliveries may be made to him without violation of the regulation.

The controls of the regulation are applicable item by item. Acceptance of delivery of any item required for authorized operations is permitted even though the inventory of some other item may be excessive. An item of controlled material is defined as "any item in any class of controlled material which is different from all other items . . . by reason of one or more of its specifications, such as length, width, thickness, temper, alloy, finish, method of manufacture, etc." The classes of controlled material include all shapes of copper appearing on the CMP Materials list, including insulated wire and cable.

Since the Controlled Materials Plan assures deliveries in sufficient amounts to maintain authorized production schedules and repair and maintenance operations, the item by item inventory control makes possible the balancing of inventories in accordance with production needs and eliminates any incentive to excessive forward buying.

The prohibition against acceptance of any item of controlled material which would result in inventories in excess of 60-day needs applies to materials in the form received from the supplier and on which no processing has been done. The regulation does not authorize any person to exceed a practicable minimum working inventory when less than a 60-day supply is needed. Inventories of all other items also remain subject to Priorities Regulation No. 1.

The CMP regulation contains provisions to take care of special circumstances and emergencies.

Because CMP Regulation No. 2 affects the way in which applications for allotments and forward orders will be made, it was decided to issue it at once, in advance of CMP Regulation No. 1, so that users of controlled materials may prepare to comply with it.

CMP Regulation No. 1, to be issued shortly, will cover general procedures for applying for, receiving and making allotments and obtaining controlled materials from producers.

EVERY PHASE of electrical maintenance and repair work covered in this library

5 volumes of practical how-to-do-it information

Every man concerned with the care and repair of electrical machinery should have these practical books, with their helpful tables, diagrams, data, methods and kinks. Every one of the five volumes is jammed to the covers with sound, how-to-do-it information—the kind you have to have when anything goes wrong. Liberal use has been made of practical data and practice in repair shops so as to combine the good features of a library of methods with handbook information covering these methods.

Electrical Maintenance and Repair Library

2042 pages, 1721 illustrations and diagrams

These books show you how to

—install all types of motor and generator units;
—locate breaks in armature windings and do a workmanlike job of rewinding;
—know just what is wrong with an electrical machine and take charge of installation and maintenance work;
—make accurate tests of switchboards and apparatus and correctly balance the power with the load;
—handle every sort of wiring job;
—show competence whether it be in the use of a Stillson wrench or a Wheatstone bridge.

Includes trouble-shooting book

Now, in addition to four well-known practical books on all details of testing, connecting, rewinding, installing and maintaining electrical machinery, the Library includes Stafford's *Troubles of Electrical Equipment*, a book giving helpful maintenance information, special trouble-shooting charts, explanation of symptoms and causes of machinery trouble, specific remedies, etc. This revised library gives you the ability to handle bigger jobs with surety of results.

10 days' examination
Easy monthly payments

We want you to examine this Library for 10 days. If you don't want them at the end of that time, there's no obligation to keep them. On the other hand if you decide you want the help these books can give, start the small monthly payments then, and in a short time the books are yours, right while you have been using them. Send the coupon today.

EXAMINATION COUPON

McGraw-Hill Book Co., Inc.
330 W. 42nd St., New York, N. Y.

Send me Electrical Maintenance and Repair Library, 5 volumes, for 10 days' examination. If I find the books satisfactory, I will send you $1.00 in 10 days, and $2.00 a month until $15.00 has been paid. Otherwise I will return the books postpaid.

Signature .....
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City and State .....
Firm or Employer .....
Position ..... EC. 2-43

UMI

MOTOR REPAIRS in Iowa City, Iowa, are handled in the shop of Frank Kovec (left) and Oscar Powell, Electric Motor Service. Biggest customers are the University of Iowa and the State Hospital.

CMP APPLICATIONS IN PROCESS

Ony those who meet the time schedule of the Controlled Materials Plan in their return of the application blanks (CMP-4A and CMP-4B), will benefit by direct allotments of controlled materials during the second quarter of this year, it was pointed out by Harold Boeschenstein, Director of the CMP Division of the War Production Board.

"While no war producer need fear that he will find himself without supplies adequate to meet his contracts, those who qualify under CMP will enjoy the advantage of allotment numbers in obtaining the three controlled materials—aluminum, copper and steel—and all other products necessary to complete their authorized schedules," Mr. Boeschenstein said. "As orders bearing allotment numbers will take precedence over those bearing preference ratings only, it is obviously to the interest of every producer who can possibly do so to have his applications on file with the proper Claimant Agency or WPB Industry Division by February 9, the date specified by the Director General for Operation in the letter, addressed to all manufacturers, which accompanied the applications and instructions."

Through the transition period from the Production Requirements Plan to the Controlled Materials Plan, that is, during the second quarter of 1943, PRP authorizations will be extended to provide a means whereby those who do not qualify within the time limit under the Controlled Materials Plan may obtain required materials.

PRICE INCREASES MUST WAIT OPA PERMISSION

Sellers who have applied for increases of their maximum prices, either under the General Maximum Price Regulation or under specific regulations, can not charge in excess of their existing maximum until such an adjustment is granted or unless they

"Take care of those pliers, son"

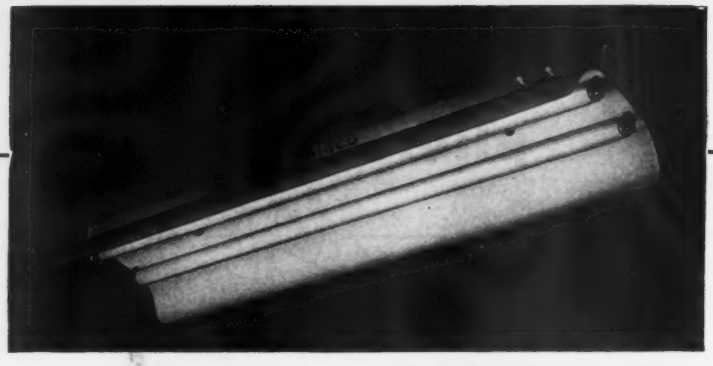
THE old-timer who knows good tools passes on the word to the "grunt" just learning "Good tools deserve good care." And today, when every tool that can be produced has a job to do licking the Axis, taking care of tools is an aid to winning the war as well as being good business.

Owners of genuine Klein equipment can rely on its high quality to assure maximum service. Proper care means longer life for tools which will be difficult, if not impossible, to replace during wartime.

ASK YOUR SUPPLIER. FOREIGN DISTRIBUTOR: INTERNATIONAL STANDARD ELECTRIC CORP., NEW YORK

Since 1857

Mathias KLEIN & Sons
Established 1857 Chicago, Ill., U.S.A.
3200 BELMONT AVENUE CHICAGO



Non-Metallic FLUORESCENTS

The new OAMCO Non-Metallic Fluorescent Fixtures for Industrial Lighting are made to conform to the simplified designs of the National Bureau of Standards.

The reflectors are made of a rigid non-metallic material and treated with two coats of glossy white, chip-proof enamel that gives them a reflection factor of 85%. Baked at 300° F., they have a tough hard surface that will not discolor.

Furnished in DOUBLE 40, TRIPLE 40 and DOUBLE 100 units, OAMCO Non-Metallic Fluorescents are adaptable to 110-125, 220-250 volt industrial installations and may be mounted by either the Jack-Chain, Direct to Conduit or End to End method. Write for information on this new War Production Line.

RIGHT LIGHT SINCE 1902

OVERBAGH & AYRES MFG. CO.

MEMBER OF THE R L M STANDARDS INSTITUTE

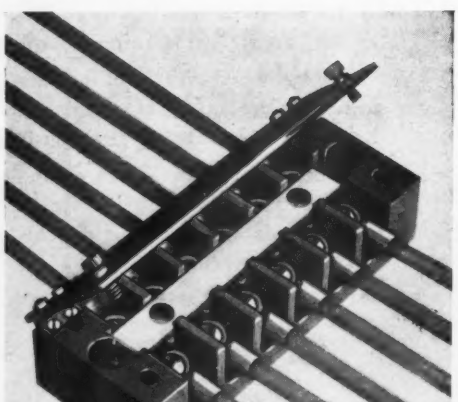
411 SOUTH CLINTON STREET • CHICAGO

One of **10 BURKE**

TERMINAL BLOCKS...

BURKE bakelite Terminal Blocks moulded under enormous pressure in hardened steel moulds—10 styles for 2 to 12 wires. Designed to go into Dispatching and Traffic Signal Systems, Switchboard, Fire and Patrol Signal Systems, etc. Impervious to moisture—high electrical resistance—fast to install and economical.

• *Write Dept.* C.T.B. *for folder and prices.*



HINGED COVER TERMINAL BLOCK

AC AND DC MOTORS AND GENERATORS

BURKE *Terminal* BLOCKS

BURKE ELECTRIC COMPANY • ERIE, PENNSYLVANIA

In the News

[FROM PAGE 111]

receive special permission to do so from the Office of Price Administration.

Again asserting this basic policy today, OPA officials also made clear that sellers could not sell at the existing maximum with an understanding any adjustment would be collected later unles they had received special permission from OPA to write this kind of an invoice.

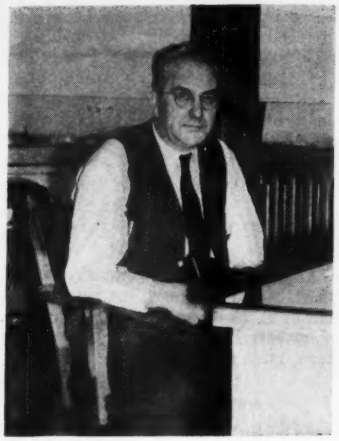
At the same time, OPA reminded sellers of the restrictions on pricing of new products, when General Maximum Price Regulation or applicable specific regulations require that the seller apply to OPA for a determination of the maximum price on the product.

A seller who must apply for a price on such a product, but who has not yet applied, may deliver on a completely open billing—that is, without designation of any price at all. Thus, a seller may not, prior to making application, deliver at a price stated to be tentative and subject to adjustment, nor may he collect any payment for the goods. After making application, he can deliver at a tentatively agreed price, subject to adjustment to conform with OPA's action, but he cannot, until OPA's determination on his application, collect the tentatively agreed price. He can, however, arrange with his buyer that the amount of the tentative price be put in escrow. Also, the seller may collect a part of the tentative price from the buyer before OPA's determination but only with the express arrangement that the seller will refund to the buyer any excess collected over the maximum finally established by OPA.

NEW VARNISHES STUDIED

Representatives of the electrical insulating varnish industry were urged at an informal meeting Friday, January 8, in Wash-

***NEW PRESIDENT** of Electric Motor and Service Association, Chicago, Bert Hohman (left), receives congratulations and well wishes from retiring president Joe Ferrari.*



CRUSADER for better lighting is H. K. Beebe, chief plant engineer, Brewster Aeronautical Corporation. Coming from Bell Aircraft in Buffalo where he made numerous better lighting installations, he is continuing his illumination crusade at Brewster by increasing and maintaining high foot-candle levels.

ington, to make up and evaluate various formulas using a variety of substitute materials. Purpose is to avoid the use of castor oil, tung oil, and oiticica oil as much as possible, as all of these are growing increasingly short. It was suggested that such formulas might include instead a variety of different materials, including linseed oil, in combination with phenolic resins. Particular emphasis was placed on the necessity for conservation of castor oil.

Applicants filing PD-600 applications for the various raw materials necessary to electrical insulated coatings were advised to list separately their requirements for the following types of material: (1) Surface coatings for cloth; (2) Varnishes for impregnation of coils and wound apparatus; (3) Enameled wire; and (4) Electrical insulating finishing varnish.

AIR CONDITIONING REPAIR GETS HIGHER RATING

Higher preference ratings have been assigned for the emergency repair of refrigerating and air conditioning systems used for specified purposes under the terms of Preference Rating Order P-126 as amended.

The amendment is a comprehensive revision of the original order controlling delivery of material for emergency repair servicing of industrial and commercial refrigerating and air conditioning systems. It restates the three classifications of users of refrigerating and air conditioning systems entitled to priority ratings under the order, and raises the ratings for replacement parts needed by users in the first class from A-1-a to AA-2X; those in the second class from A-3 to AA-3 and the third class from A-8 to AA-4.

Whenever a rating of AA-2X is applied to delivery to users in the first class, the service agency applying the rating must notify the War Production Board promptly

FURNISHED ON A PRIORITY BASIS ONLY

FOR WAR WIRING
use MONCOR
SURFACE WIRING DEVICES

Ideal for Cantonments, War Housing, Field Huts, Temporary Industrial Buildings

Use these good looking devices for surface wiring in war buildings and in war purpose warehouses, industrial buildings, etc. They can be installed quickly using either BraidX or BX. Special knockouts in the ends, sides and back of devices enable them to be end connected, side connected (knob and tube wiring) or back connected for concealed wiring.

These devices meet all requirements on every surface wiring job with cables hidden or exposed. They are made of brown Textolite, keep their color and resist breakage. Moncor Surface Wiring Devices are approved by the Underwriters' Laboratories and in the specifications of different government agencies.

For further information see the nearest G-E Merchandise distributor or mail the coupon.

General Electric Company
Section D231-8
Appliance and Merchandise Dept.
Bridgeport, Conn.

Sirs: Please send me information on Moncor Surface Wiring Devices.

Name .....

Address .....

City ..... State .....

GENERAL ELECTRIC

- - use Thin - Wall or Thick-Wall conduit at any outlet (or a Threaded connection)

You can attach ANY kind of conduit at ANY outlet of a Kondu fitting. Just insert the bushing needed. (Threadless or Threaded connection, as required.)

This certainly is a big help in keeping down your fitting inventory.

Another feature that you'll like—

Every Kondu box is a union. Change boxes any time without disturbing conduit. Or you can put in a conduit line before the fittings are delivered.

100% re-usable . . . Kondu fittings are practically unbreakable . . . You get a conduit line that's in perfect alignment, permanently rigid, vibration-proof.

Write for the Kondu Catalog.

KONDU CORPORATION
Erie, Pa.

Now in our new plant, 1040 West 12th St.

KONDU

The Threadless Fitting Line of Unequalled Variety

In the News

[FROM PAGE 113]

by telegram or letter explaining the circumstances requiring the application of such rating, stating the material obtained and naming the supplier.

Comfort cooling systems, as defined in the order, of any size operated for the purpose of lowering the temperature or humidity of air in any building, room or other enclosure are not provided for by any ratings. The order lists the types of use included within the definition of "Comfort Cooling Systems." It excluded from the definition, however, such parts of comfort cooling systems as may be required for the circulation of air or for raising the temperature during cold weather to a degree which is comfortable or tolerable for persons.

Emergency service agencies cannot deliver any metallic parts unless the owner of the system turns in the old part immediately upon installation of the new in order that such old parts may be repaired, reconditioned or disposed of to a scrap dealer.

None of the provisions of the amended order applies to domestic mechanical or ice refrigerators.

The term "emergency service agency" as defined in the amended order covers any person engaged in performing repair services and holding an "emergency service agency certificate" issued by the War Production Board.

WITH THE Manufacturers

Westinghouse Appointments

Bernard H. Sullivan, manager of sales for the Westinghouse Lamp Division, Bloomfield, N. J., has been assigned responsibility for all commercial activities involving lamps and special products, and Ralph C. Stuart has been appointed manager of manufacturing and engineering for the Division. Mr. Sullivan will continue to have charge of the Illuminating Engineering and Commercial Engineering Departments, as well as sales, advertising and Division district offices.

Charles F. Billings, has been appointed industrial relations manager of the Lamp Division with headquarters in Bloomfield, N. J. Mr. Billings succeeds Walter F. Oliver, who has been granted a leave of absence to become director of the Civilian Personnel Branch, U. S. Army Ordnance Department in New York City.

John Rosevear has been appointed staff assistant in the Industrial Engineering and Equipment Department of the Westinghouse Lamp Division, Bloomfield.

•

G-E Changes

Philip D. Reed, chairman of the Board of the General Electric Company has resigned from all of his company posts. Mr. Reed is going to continue his work in London as deputy chief of the Harriman Mission.

R. W. Beard, who formerly handled planning and execution of the G-E Federal and Marine program in the San Francisco territory, has been named assistant to the manager of the Company's Lighting Division in Schenectady, N. Y.

•

The Chase-Shawmut Company, Newburyport, Mass., announces the appointment of Alfred E. Lonnberg as sales manager. Mr. Lonnberg has served as assistant sales manager for a number of years.

•

Irvington Varnish and Insulator Company, Irvington, N. J., has appointed S. Caplan research manager and acting technical director. Mr. Caplan succeeds C. F. Hanson, who has been appointed chief consulting engineer.

•

Brown Company, Berlin, N. H., announces the appointment of Wentworth Brown as manager of production. He replaces John D. McCrystle who has resigned from the company.

•

Eagle Electric Mfg. Co. has moved from Brooklyn, into new quarters at 23-10 Bridge Plaza South, Long Island City, N. Y.

More Gossip

Enters Electronic Field

Leo D. Swidler, Harry Primakow and Audrey McCants are incorporators of the new Electronic Supply Corp., Milwaukee, Wis. The organization was formed to carry on the business of electricians, electrical engineers and electronic supplies.

Livingston Opens Washington Office

J. Livingston & Company, electrical contractors, have opened an office at 502 Hibbs Building, Washington, D. C. They also have offices in New York, Boston, Chicago, Detroit and Hartford.

Inspector Now Engineer

James H. Ehret, former chief electrical inspector of Sioux City, Ia., now has the position of assistant electrical engineer for the Russell D. Moore Co., on a government project at Ottumwa, Ia. Previous to this, Mr. Ehret was in the engineering department and had charge of the electrical inspection at the Sioux City air base.

How to save time by doing more reading

That is a profitable paradox for you. More true today than perhaps ever before. For here in the pages of this publication are packed many helpful ideas . . . considerable useful information. Much of it, in fact, available from no other source.

And we most emphatically mean *both* the editorial and the advertising pages.

Just one new idea gleaned from these pages . . . a method for doing something better or faster or easier or at lower cost, may alone save you far more than a year's reading-hours invested in this and other worthwhile business papers.

Many people have found this a fact . . . not only once, but time and time again. That's significant . . . with time so precious today.

★

Good advertising speeds information from those who have it . . . to those who need it.

★

McGraw-Hill Publishing Company, Inc.

330 West 42nd Street New York

Saving Metals In Fluorescent Lighting [FROM PAGE 20]

In the fluorescent group the colored types are available only from existing inventory, leaving only the Daylight and White now in production in all sizes from 15 to 60 inch.

Ballasts

The use of the 2-lamp and the new 4-lamp ballast makes possible further economies. The 4-lamp ballast operates 4, 100-watt lamps on a new sequence starting circuit. It is rated at 265 volts and operates within a voltage range of 250 to 280 volts. They are suitable for installation on 3-phase, 4-wire circuits rated 254/440 volts, 265/460 volts or 277/480 volts which are common industrial distribution voltages in new war plants. This voltage range makes it possible to connect to power supply feeder circuits without step-down transformers. For 240 volt systems, small auto-transformers may be used at each ballast to step up the voltage. On larger installations it may be more economical to locate the step-up auto-transformer at the panel or distribution center. Where distribution systems available are 480 volts, delta or higher voltages, insulating transformers may be used to provide the necessary voltage for the lighting system.

Metal Economies

In considering metal economies in the application of fluorescent lighting it is important to keep in mind that the fluorescent lighting system itself is an important economy in metal. The high lumen output per watt of fluorescent systems means more light for less copper, conduit, apparatus and generating capacity. Consequently in cutting corners on wiring, application and installation it is important that the economies be net savings and not rolled back to overloading feeders, excessive voltage drop, low power factor or other conditions which may waste more critical materials than the savings are worth.

The maintenance schedule set up for the cleaning and relamping of industrial lighting systems is an important factor in saving critical materials. Lighting system designs are developed on the basis of an assumed maintenance factor. Without careful maintenance the illumination gradually drops below the design level wasting the critical materials which were allocated for the system, slowing production and wasting power.

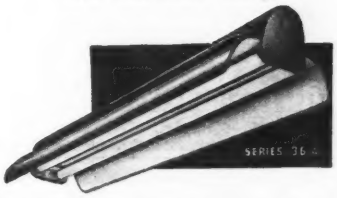
It's Non-Metallic

Up-to-the minute in design
A seller for today
Durability for tomorrow

Only Ounces of Steel in hood and reflector

INDUSTRIAL FLUORESCENT *individual units*

for two and three 40-watt and two 100-watt lamps



Designed for the War Industry

This new fixture development contains approximately 5% of the critical materials used in an all metal fixture and approximately 10% of the critical materials used in a fixture with a metal housing and non-metallic reflector; thus conserving the maximum of strategic materials for the war effort. It is fire resistant—water repellant—rugged and good appearing.

All fixtures are finished with our own "Klasium" enamel which is fire resistant and has a reflecting factor of approximately 86%. A finish proven by years of service.

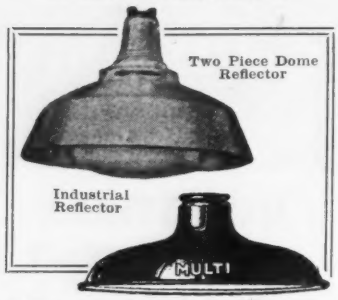
Already this fixture is performing meritorius service for the Army and Navy under severe service conditions.

UNDERWRITERS LABORATORIES APPROVED

Write—wire or phone about this fixture today.

LIGHTING PRODUCTS, INC.
HIGHLAND PARK, ILLINOIS

INCANDESCENT REFLECTORS
by
MULTI
for profitable war plant installations

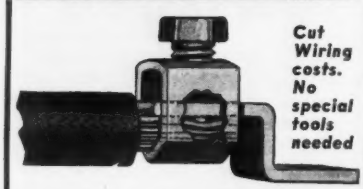


● There is a big place in industry for Incandescent lighting and MULTI Incandescent Reflectors give excellent results in service and in appearance. You can be sure of a good looking job, a substantial profit on every installation, and no after worries—they are designed for the job—

Send for complete catalog.

MULTI
ELECTRICAL MANUFACTURING CO.
1840 W. 14th St., CHICAGO, ILL.

ILSCO
Electrical Connectors



Cut Wiring costs. No special tools needed

JAWS GRIP LIKE A VISE

Ilsco
SINGLE HOLE
SOLDERING LUGS

A MIGHTY grip is exerted by the serrations in collar and tongue on the wedged-in wires. Even pressure and maximum contact ever present over the curve of the conductors. Drawn from cold-worked copper in our own plant.

Please send sample and new 32-page illustrated catalog.

FIRM NAME .....
NAME .....
ADDRESS .....

ILSCO COPPER TUBE & PRODUCTS CO.
CINCINNATI, OHIO

More Gossip

Gets Navy Wings

Bob Collins, son of Walter Collins, secretary, Electrical Contractors Association, City of Chicago, is now addressed as "Ensign Collins". Bob, who was awarded his gold wings Nov. 27, at Corpus Christi, Texas, is now stationed at the Naval Air Station, Miami, Florida and is scheduled to be in a torpedo bomber squadron.

Working at Pearl Harbor

Lawrence P. LaHaye, proprietor of LaHaye Electric Co., Green Bay, Wis., is on his way to Pearl Harbor. He has taken a civil service position as an electrician at the naval base. His business will continue in operation during his absence.

AST Appoints Biester

William Biester, president of the Electric Construction Company, Philadelphia, has been appointed an alternate member of the American Standards Association's Sectional Committee on the National Electrical Code (Regulations of the National Board of Fire Underwriters for Electrical Wiring and Apparatus).

With The Seabees

Frank Brunia, son of William Brunia, Brunia Electric Co., Des Moines, Ia., has temporarily taken leave of his dad's contracting and motor repair business to join the U. S. Navy Seabees—naval construction crew. Frank recently shipped out of San Francisco to points unknown—to the enemy.

SIDESTEPS PRIORITIES PINCH by taking on a line of giftwear. Mr. and Mrs. F. E. Jackson, owners of Jackson's Electric and Gift Shop, Iowa City, Iowa used this means of offsetting the sharp reduction in their contracting and major appliance business due to the war.

SEARCHLIGHT SECTION

(Classified Advertising)

Employment **Business**

Equipment

(Used or Resale)

"OPPORTUNITIES"

UNDISPLAYED RATES

15 Cents a Word. Minimum Charge $3.00. POSITIONS WANTED (full or part time individual salaried employment only), ½ the above rates payable in advance.

BOX NUMBERS—Care of publication New York, Chicago or San Francisco offices count as 10 words. DISCOUNT OF 10% if full payment is made in advance for 4 consecutive insertions.

DISPLAYED RATE

INDIVIDUAL SPACES with border rules for prominent display of advertisements.
The advertising rate is $7.50 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request. AN ADVERTISING INCH is measured ⅞" vertically on one column, 3 columns—30 inches—to a page.

NEW ADVERTISEMENTS received by February 17th will appear in the March issue, subject to limitations of space available.

WANTED

HIGH GRADE ELECTRICAL MAN

Must be thoroughly familiar with all types of electric motors, starters, controls, etc. Need not be graduate engineer, but must have proven sales and executive ability. Please give complete details in first letter.

Permanent position at substantial salary to right man. Please do not answer unless you meet fully the requirements outlined.

P-300, Electrical Contracting
520 North Michigan Ave.,
Chicago, Ill.

USED EQUIPMENT

WE BUY AND SELL
MOTORS
TRANSFORMERS
MOTOR GEN. SETS
OIL SWITCHES
AIR CIRCUIT BREAKERS
ELECTRIC EQUIPMENT CO.
678 Lake Ave., Rochester, N. Y.
Tel: Glenwood 6783

HELPING CONTRACTORS is all in a day's work for Russell E. Vierheller, business manager, St. Louis Chapter, NECA. Development of a set of apprenticeship training standards with Local Union No. 1, IBEW, was an outstanding accomplishment of the group.

Knight Heads Wisconsin IAEI

E. C. Knight, Watertown, was elected Chairman of the Wisconsin Chapter, Western Section, International Association of Electrical Inspectors, at the annual convention of that group in Green Bay, Wisconsin. E. W. Vollbrecht, Sheboygan was elected vice-chairman and the secretary-treasurer is John E. Wise, Madison, a member of the state industrial commission.

Executive Board members include Otto Hackbarth, Marinette; A. B. Middlemas, Milwaukee; and A. A. Allen and G. T. Fiedler, both of Green Bay.

Permits Include Insurance

Future permits issued for the installation of signs and canopies overhanging sidewalks at Manitowoc, Wisconsin will carry an extra fee. This is to pay for blanket insurance to be carried by the city to protect pedestrians who suffer injuries therefrom. Previously, individual business establishments had to carry their own insurance.

License Law Has Teeth

A Providence, R. I., electrician, employed as an electrician in a local war plant, found out that slipping in a bit of electrical contracting on the side is an unprofitable business—especially when there is a state law regulating such unethical practices.

He now has the dubious distinction of being the first person to have his journeyman's license revoked for an indefinite period by the Rhode Island State Board of Examiners of Electricians — administrator of the new electrician's licensing law. The action resulted after the offender ignored repeated warnings and continued to contract work after hours.

Here's Why

ELECTRICAL MANUFACTURERS

buy

IRV-O-LITE XTE-30

The Rubicon Company has used IRV-O-LITE for two years to insulate the intricate wiring of laboratory instruments. In the photo above, a length of bus bar insulated with XTE-30 is being formed and cut to fit a potentiometer circuit.

WHETHER used as wiring or lug insulation or as conduit, this extruded plastic tubing will do a good job even under difficult conditions. It has been employed on tiny, fractional horsepower motors and on giant aircraft; in the construction of sensitive laboratory equipment and in rough-riding Army tanks.

IRV-O-LITE XTE-30 is suitable for such diverse installations because random samples consistently live up to these standards:

Dry Dielectric Strength	750 VPM
Wet Dielectric Strength	350 VPM
Tensile Strength Lbs. per Sq. In.	2,150
Elongation	250%
Resistance to Brittleness. Standard wall XTE tubing does not shatter when slowly pinched with pliers at	—40 deg. F.
Life at 105° C.	400 hrs.
Wemco Oil Immersion 48 hrs. at 100° C.	Intact, can be flexed
Resistance to 50% Sulphuric Acid at 72° F.	Unaffected
Resistance to 30% Sodium Hydroxide at 72° F.	Unaffected
Resistance to Mineral Solvents	Excellent
Resistance to Coal Tar Solvents	Good

In addition to being unusually flexible and elastic over a wide range of temperatures, XTE-30 tubing is also highly resistant to tearing and abrasion.

IRV-O-LITE XTE-30 is produced in sizes ranging from A.S.T.M. No. 24 to 1½" I.D. and in six opaque colors, black, green, white, yellow, red and blue, to simplify identification of circuits. Standard lengths are 36-inch pieces and 25-ft. coils. Continuous length coils and cut pieces from ¼" to 12" can also be furnished.

NEW! Most recent addition to the Irvington Fibronized tubing line, XTE-130 was developed to withstand unusually high temperatures. Samples of No. 9 opaque have yielded an oven life of 500 hrs. at 125° C. (257° F.), 1000 hrs. at 105° C. (221° F.).

IRV-O-LITE XTE-130 offers a dielectric strength of 1000 VPM both wet and dry, tensile strength of 4000 lbs. per sq. in. Although slightly less flexible than XTE-30 at room temperature, this tubing resembles it in other respects. XTE-130 is obtainable in black, green, white, yellow, red, blue and clear, in A.S.T.M. sizes No. 20 to 1½" I.D. and same lengths given above.

For additional information or for testing samples write Dept. 96.

Over 25,000,000 feet of IRV-O-LITE now serving industry

Irvington

VARNISH & INSULATOR COMPANY

IRVINGTON, N. J., U. S. A. • PLANTS AT: IRVINGTON, N. J. & HAMILTON, ONT., CAN.

Representatives in 20 Principal Cities

STANDARD OF THE WORLD — IRVINGTON INSULATION — TRADE REG. U. S. PAT. OFF. MARK

for Results

use

Mc GRAW-HILL
DIRECT MAIL LIST SERVICE

MAILING LISTS THAT WORK...

McGraw-Hill Industrial Mailing Lists are a direct route to today's purchase-controlling executives and technicians in practically every major industry.

These names are of particular value now when most manufacturers are experiencing constantly increasing difficulty in maintaining their own lists.

Probably no other organization is as well equipped as McGraw-Hill to solve the complicated problem of list maintenance during this period of unparalleled changes in industrial personnel. These lists are compiled from exclusive sources, based on hundreds of thousands of mail questionnaires and the reports of a nation-wide field staff, and are maintained on a twenty-four hour basis.

Investigate their tremendous possibilities in relation to your own product or service. Your specifications are our guide in recommending the particular McGraw-Hill lists that best cover your market. When planning your industrial advertising and sales promotional activities, ask for more facts or, better still, write today. No obligation, of course.

McGraw-Hill Publishing Co., Inc.
DIRECT MAIL DIVISION
330 West 42nd Street **New York, N. Y.**

More Gossip

Approve Wausau License Law

An ordinance licensing the installation and maintenance of electric wiring and equipment in the city of Wausau, Wis., was approved by the common council on January 5.

Under the new regulation, electrical contractors must pay an annual license fee of $20, while an electrical maintenance license costs $5. Applicants for licenses will be examined by a Board of Electrical Examiners consisting of the city electrician, the committee on lighting and the judiciary committee.

A Maintenance Pioneer

Back in the horse-and-buggy days of 1897, when New York was just entering its skyscraper era, a small group of men foresaw the ultimate development of vertical transportation and the necessary maintenance of elevator equipment. So they formed the Maintenance Company, probably the first organization to enter into the maintenance of electrical equipment, including upkeep and repairs, on a contract basis.

Today, this company is celebrating its 45th anniversary as a service organization operating in the metropolitan New York area. In that time it has branched out so it now includes the following divisions: maintenance; elevator repair and modernization; motor repair; machine shop; light and power wiring; industrial plant moving; equipment and supplies; and engineering and advisory. Its personnel includes an impressive list of engineers and skilled mechanics who are truly career men. Bill Wheeler can be justly proud of his organization and the service it is rendering.

BUSINESS MANAGER W. C. Bryant, Greater Kansas City Chapter, NECA, is doing a lot of leg work these days formulating joint venture combinations among his members.

UMI

Blackout Control of Store Lighting

[FROM PAGE 27]

lighting system and the type of equipment installed.

Most of the devices for extending existing switches, shown in the attendant self-explanatory diagrams, are easy to construct and do not require critical materials. Many of them are not adapted to heavy lighting loads and in such cases more extensive systems must be designed and installed. In general, they cover exterior control of tumbler, pushbutton, pull and safety disconnect switches; exterior electric signs; use of a shorted plug as a switch; night light control and exterior control of remote control switches. Night lights require special consideration because they are effective protective measures. Store owners and managers should consult their insurance companies for specific regulations concerning the use of night lights.

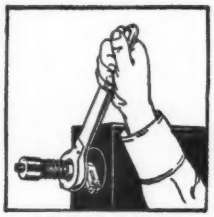
Outside operation of remote control switches presents a more complicated problem. Two methods of doing this are outlined in the accompanying Diagram 10. Where both a time switch and a remote control switch are involved, the connections must be made so that the remote control switch will open under any circumstances when the emergency control is operated, and at the same time, not interfere with the setting of the time clock.

The ideas outlined herein may seem somewhat devoid of fancy dress. But, from the practical standpoint they do the job, eliminate hard-to-get critical equipment, are inexpensive and are designed as temporary installations to last only for the duration.

C. H. CHRISTINE, secretary-manager, St. Louis Electrical Board of Trade, reports that their A. W. activities have led to electrical adequacy for St. Louis' war housing.

WHERE TO BUY

Equipment, Materials and Supplies for Electrical Construction — Maintenance — Repairs



A 3" Hole in 3 Minutes

Write for Circular

The Jiffy Line HAS GONE TO WAR

"Jiffy" HOLE CUTTER

Adjustable any dia. ¾" to 6"
Cuts perfect round holes in steel plates or boxes.

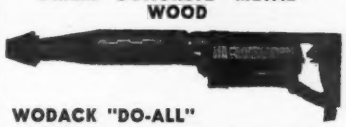
"Jiffy" PIPEBENDER VISE

Bends ½" and ¾" conduit.
Won't flatten or kink pipe. Makes offsets, saddles, etc.

Priority required

CLYDE W. LINT CO., 100 So. Jefferson St., CHICAGO

DRILLS CONCRETE—METAL—WOOD



WODACK "DO-ALL" ELECTRIC HAMMER AND DRILL

Saves time and money installing expansion anchors. Drills concrete to 1⅜" dia.; metal to ⅜". Two tools in one. Easy to maintain. Universal motor. Write for folder.

Wodack Electric Tool Corporation
4628 W. Huron St. Chicago, Ill.
Telephone AUstin 9866

"FRIGID" VENTILATING EQUIPMENT

Circulators, Exhaust Fans, Blowers, Attic and Industrial Fans, Spray Booth Fans, Shutters

See your wholesaler

Circulators and Devices Manufacturing Corp.
100 Prince St. New York, N. Y.

TORK

TURN ANYTHING ELECTRICAL ON & OFF REGULARLY

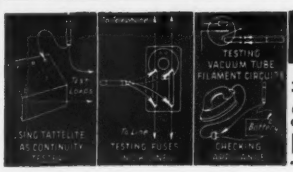
The TORK CLOCK CO., Inc.
MOUNT VERNON, NEW YORK

ON THE JOB EVERY INSTANT

ZENITH MAGNETIC CONTACTOR

Especially developed for severest duty with large electric flashers, and heavy surge of Type C lamps. Electrically held. Hum reduced to minimum. Used with Time switches, flashers, bombarders, many other purposes. 30 to 400 amps. A.C. & D.C. Get complete Catalog of Zenith Automatic Equipment.

ZENITH ELECTRIC CO.
845 S. Wabash Ave., Chicago, Ill.



3 LITTELFUSE *Pocket* TATTELITES

3-20 V., and 6-50 V. $1.75 ea. 60-500 V., $1.00

Check instruments, radio, communications, airplanes, etc., for open circuits and scores of troubles. *"Tattelite tells the tale".*

LITTELFUSE INC., 4789 Ravenswood Ave., Chicago, Ill.

A Good Habit

This Where To Buy Section supplements other advertising in this issue with additional announcements of products and materials of special interest and application in the electrical construction, maintenance and repair. Make a habit of checking this page each issue.

Complete Line

OF SODERING FLUXES

We have "the proper flux for every sodering job"

L. B. ALLEN CO., INC.
6715 Bryn Mawr Ave., Chicago

New WILEY FLUORESCENT LIGHTING

Instantaneous Starting: Non-Metallic Reflectors

WILEY Fluorescent Fixtures are now equipped for instantaneous starting, eliminating starter troubles. Tube lights fully, without flickering, at the turn of the switch. Lamp life very satisfactory; maintenance expense greatly reduced.

WILEY industrial fluorescent fixtures are now made with non-metallic reflectors. Same durable, baked plastic finish is used, giving highest lighting efficiency.

Sales Representatives Wanted

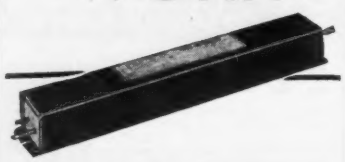
Prompt deliveries—and good inquiries—offer exceptional opportunity to capable men. Valuable industrial territories are open.

Write for Booklet EC-23

R. & W. WILEY, INC. 777 Hertel Ave., BUFFALO, N. Y.

Member Fleur-O-Lier Manufacturers' Association

MAKING LIGHT WORK



OF WAR PRODUCTION PROBLEMS

Many production problems are being solved by adequate lighting of important machining and assembly operations. Acme's four-lamp ballasts makes light *work;* one ballast provides exact operating characteristics for 4—100 watt lamps. Better performance, efficiency and service. Write for Bulletin 157.

THE ACME ELECTRIC & MFG. CO.

36 Water St. **Cuba, N. Y.**

Acme ACME Electric TRANSFORMERS

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★ These companies have included Briefalogs, containing additional buying information on their products, in the 1943 edition of the Electrical Buyers' Reference.

UMI

"is this a live circuit?"
"which fuse is blown?"
"A.C. or D.C.?"
"what voltage?"

all the answers in a jiffy with this pocket-sized and practically indestructible

SQUARE D *Voltage Tester*

● Ask your Square D distributor about this voltage tester. See if it isn't one of those handy stand-bys you'll want to have.

Notice the convenience and safety with which you test voltages and types of current without the use of lamps. Simply establish contact and the indicator shows the voltage. Each voltage is shown by a different colored band for easy, accurate reading. A.C. is distinguished from D.C. by vibration of the indicator. Sharp prongs permit piercing insulation, when necessary, without damage.

You'll get years of real service out of this tester—it's built to stand the gaff. See your distributor or write us direct for descriptive folder.

SQUARE D COMPANY

DETROIT - MILWAUKEE - LOS ANGELES

KOLLSMAN INSTRUMENT DIVISION, ELMHURST, NEW YORK

IN CANADA: SQUARE D COMPANY CANADA LIMITED, TORONTO, ONTARIO

In Every Part of the Country

LIBRARY
COLO STATE COLLEGE
FT COLLINS COLO
C 3-39

...IALS DISTRIBUTORS OFFER SUPPLIES FOR WAR PROJECT WIRING

You'll find the supplies you need for war wiring jobs . . . for wiring system maintenance . . . for wiring system conversion or extension . . . for new wiring systems . . . at the General Electric Wiring Materials distributor located near you. There are over 175 of these distributors located at key points all over the country.

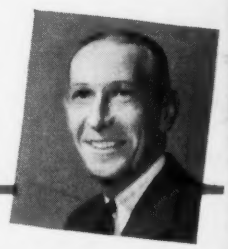
In addition, you'll find your General Electric Wiring Materials Distributor can help you in many ways . . . give assistance in choosing materials and in planning wiring . . . give information on materials for power distribution, fluorescent lighting, lighting control, etc. . . . schedule efficient deliveries.

Your G-E Wiring Materials Distributor handles a large line of conduits, boxes and fittings, wires and cables, and wiring devices made by one manufacturer. These materials, all coming from one source, have uniform high quality and are easy to work with. Take advantage of this close source for materials and service.

G. W. Betke (left), sales manager and William Eller, purchasing agent, Midland Electric Company, Cleveland, Ohio, G-E distributor, are checking cable suitable for war project customer is wiring.

Sales meetings are held at the Salt Lake City, Utah, General Electric Supply Corporation house as they are at other G-E distributors' houses to determine ways of best aiding customers. In photograph, men leaving meeting are left to right: Top row, W. O. Smith, sales manager; William Walker, service department; W. B. Roberts, salesman—Lower row, J. E. Bolton, salesman; J. L. Fahey, operating manager.

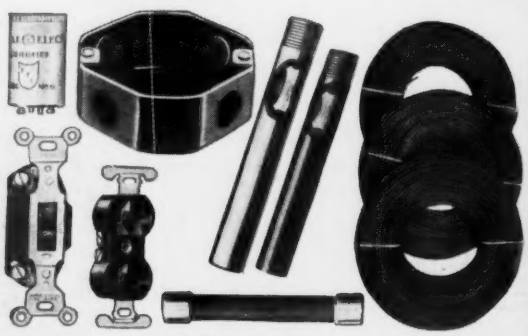
Brooklyn, N. Y., General Electric Supply Corporation's shipping room like the shipping rooms of the other G-E distributors, is busy getting wiring materials out to customers for war jobs. In the photograph, left to right: Horace Herzog, William Schlott, Frank Murphy and Frank Byrnes.



General Electric district representatives in all parts of the country help distributors serve customers. This is O. F. Kypta, who covers Washington, District of Columbia, and Maryland.

G-E WIRING MATERIALS

See the G-E Wiring Materials Distributor near you about conduit, boxes and fittings, wire and cable and wiring devices for your special requirements. Appliance and Merchandise Department, General Electric Co., Bridgeport, Conn.



GENERAL ELECTRIC

UMI